MATHEMATICS-IX

Module - 8

INDEX

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STATISTICS

IMPORTANT POINTS

1. The word data means information (its exact dictionary meaning is: given facts). Statistical data are of two types : (i) Primary data (ii) Secondary data

2. When an investigator collects data himself with a definite plan or design in his (her) mind, it is called **Primary data**.

3. Data which are not originally collected rather obtained from published or unpublished sources are known as **Secondary data**.

4. After collection of data, the investigator has to find ways to condense then in tabular form in order to study their silent features. Such an arrangement is called **Presentation of data**.

5. Raw data when put in ascending or descending order of magnitude is called an array or arranged data

6. The number of times an observation occurs in the given data is called frequency of the observation

7. Classes/class intervals are the groups in which all the observations are divided

8. Suppose class-interval is 10-20, then 10 is called lower limit and 20 is called upper limit of the class

9. Mid-value of class-interval is called **Class-mark**

Class-mark $= \frac{\text{lower limit + upperlimit}}{2}$ Class-mark = lower limit + $\frac{1}{2}$

(difference between the upper and lower limits)

10. If the frequency of first class interval is added to the frequency of second class and this sum is added to third class and so on then frequencies so obtained are known as **Cumulative Frequency (c.f.).**

11. There are two types of cumulative frequencies (a) less than, (b) greater than

SUMMARY OF THE CHAPTER

1. INTORDUCTION

In our day-to-day life we come across different types of informations through different means such as television channels, radio, newspapers, news magazeines etc. These informations can be given in the form of a

(i) table-e.g., a table showing prices of different shares on a particular day.

(ii) bar graph - e.g., bar graphs comparing the scores of a particular team in last five, one day matches.

(iii) numerical figures- e.g., batting or bowling averages of a particular cricketer.

(iv) chart- e.g., pie chart showing expenditure plans of a country in the different fields. And many more forms.

The facts or numerical figures which are collected for some definite purpose are called data and the extraction of information through this data is called statistics.

In the present chapter, we shall study the collection, Presentation and analysis of data to draw the important conclusions from it.

2. COLLECTION OF DATA

Information can be gathered either by a particular person who investigates himself and collects the information or it can be gathered from a source which already had the information. For example, if we want to know the number of member of each family who live in a particular society. Then either we can interrogate each family to get the number of members in a family or we can directly approach to the secretary head) of the society who already has the stored information about every family of its society.

Depending upon the way in which the data has been collected, there are following two types of data

(i) Primary data (ii) Secondary data

Primary data. When the information is collected by the investigator himself with a definite objective in his mind, the data obtained is called primary data.

Primary data is also called first hand data. It is an original data. Primary data is always related to a specific objective of the investigation so do not need any adjustment for the concern study. But primary data is costly in terms of time, money and efforts.

Secondary Data. When the information is collected from a source which already had the information stored, the data obtained is called secondary data.

Secondary data is also called **second hand data** as collected by someone else. It is already in existence and therefore is not original. Since secondary data had already been collected for some other purpose therefore needs to be adjusted to suit the objective of study in hand. It requires less time, money and efforts as compared to primary data.

PRESENTATION OF DATA

The data without any kind of numerical sequence is called raw data. After collection of raw data we need to arrange it so that it can be understood easily, its salient features can be studied and conclusions can be drawn from it at a glance. This arrangement of data is called presentation of data.

RAW OR UNGROUPED DATA

The data obtained in original form are called raw data or ungrouped data.

Ex. The marks obtained by 25 students in a class in a certain examination are given below:

25, 8, 37, 16, 45, 40, 29, 12, 42, 40, 25, 14, 16, 16, 20, 10, 36, 33, 24, 25, 35, 11, 30, 45,48.

This is the raw data.

Array : An arrangement of raw data in ascending or descending order of magnitude is called an array.

Arranging the marks of 25 students in ascending order, we get the following array.

8, 10, 11, 12, 14, 16, 16, 16, 20, 24, 25, 25, 25, 29, 30, 33, 35, 36, 37, 40, 40, 42, 45, 45, 48.

TO PREPARE A FREQUENCY DISTRIBUTION TABLE FOR RAW DATA USING TALLY MARKS

We take each observation from the data, one at a time, and indicate the frequency (the number of times the observation has occurred in the data) by small lines, called tally marks. For convenience, we write tally marks in bunches of five, the fifth one crossing the fourth diagonally. In the table so formed, the sum of all the frequencies is equal to the total number of observations in the given data.

Ex. The sale of shoes of various sizes at a shop, on a particular day is given below:

7	8	5	4	9	8	5	7	6	8	9	6	7	9
8	7	9	9	6	5	8	9	4	5	5	8	9	6

The above data is clearly raw data.

From this data, we may construct a frequency table, as given below :

Frequency Table

Size	Tally Marks	Frequency
4	II	2
5	𝍸	5
6	IIII	4
7	IIII	4
8	𝍸 I	6
9	𝍸 II	7
Total		**28**

CUMULATIVE FREQUENCY OF A CLASS-INTERVAL

The sum of the frequencies of all the previous classes and that particular class, is called the cumulative frequency of the class.

Cumulative Frequency Table

A table which shows the cumulative frequencies over various classes is called a cumulative frequency distribution table.

GROUPED DATA

To put the data in a more condensed form, we make groups of suitable size, and mention the frequency of each group. Such a table is called a grouped frequency distribution table.

Class-Interval : Each group into which the raw data is condensed, is called a class-interval.

Each class is bounded by two figures, which are called class limits. The figure on the left side of a class is called its lower limit and that on its right is called its upper limit.

Types of Grouped Frequency Distribution

1. **Exclusive Form (or Continuous Interval Form) :** A frequency distribution in which the upper limit of each class is excluded and lower limit is included, is called an exclusive form.

Ex. Suppose the marks obtained by some students in an examination are given.

We may consider the classes 0 – 10, 10 – 20 etc. In class 0 – 10, we include 0 and exclude 10. In class 10 - 20, we include 10 and exclude 20.

2. **Inclusive Form (or Discontinuous Interval Form) :** A frequency distribution in which each upper limit as well as lower limit is included, is called an inclusive form. Thus, we have classes of the form 0 – 10, 11 – 20, 21 – 30 etc. In 0 – 10, both 0 and 10 are included.

It can be arranged in any one of the following ways-

The difference of lowest and highest values in the data is called range of the data.

IMPORTANT TERMS RELATED TO GROUPED DATA

1. **Class Boundaries Or True Upper And True Lower Limits :**

(i) In the exclusive form, the upper and lower limits of a class are respectively known as the true upper limit and true lower limit.

(ii) In the inclusive form, the number midway between the upper limit of a class and lower limit of the subsequent class gives the true upper limit of the class and the true lower limit of the subsequent class .

Thus, in the above table of inclusive form, we have :

true upper limit of class 1 – 10 is $\left(\frac{10+11}{2}\right)$ = 10.5, and, true lower limit of class 11 – 20 is 10.5.

Similarly, true upper limit of class 11 – 20 is $\left(\frac{20+21}{2}\right)$ = 20.5, and, true lower limit of class 21 – 30 is 20.5.

2. **Class Size :** The difference between the true upper limit and the true lower limit of a class is called its class size.

3. **Class Mark of A Class** = $\left(\frac{\text{True upper limit + True lower limit}}{2}\right)$

The difference between any two successive class marks gives the class size.

When the number of observations in an experiment are large, it becomes a tedious job to arrange it in ascending or descending order. It can be quite time consuming as well.

Tabular form. When the number of observations in an experiment are large we can represent it in tabular form in the following ways-

(I) Discrete frequency distribution table.

Here, against each observation, its frequency (number of times it is occuring) is written. The table hence obtained is called ungrouped or discrete frequency distribution table.

(II) Non-overlapping grouped frequency distribution table.

When observations are still large, range is large and the values of observations are not so frequent, then we divide the values of observations into different groups. For grouping the data we follow the steps given below:

Step 1. First of all we find the lowest and highest observation values and then range of the given data using range = highest observation value - lowest observation value.

Step 2. Then we make groups, also called classes, of equal width or class size so that first group contains the lowest observation value and the last group contains the highest observation value. While deciding the number of groups or size of each group we can make use of the fact that

$$\text{approximate value of class size} = \frac{\text{range}}{\text{No. of groups}}$$

Clearly we can make more classes of short size and fewer classes of larger size.

It should be noted here that the groups or classes should be of the form 10-19, 20-29, 30-39 etc., so that groups, are non-overlapping. Here for these groups, all least value are called lower limits and the greatest value are called upper limits. For example, for the group 20-29, 20 is the lower limit and 29 is the upper limit. Also 10 (20 to 29) is the size of class.

Step 3. Then we write all groups in the first column of a table. Consider the observations one by one and put tally marks against the group in which the particular observation is contained.

Step 4. By counting the tally marks we write frequencies against each group in the third column.

(It should be noted here that sum of all frequencies = total number of observations.)

The table hence obtained is called non-overlapping or non-continuous grouped frequency distribution table

GRAPHICAL REPRESENTATION OF STATISTICAL DATA

The tabular representation of data is an ideal way of presenting them in a systematic manner. When these numerical figures are represented pictorially or graphically, they become more noticeable and easily intelligible, leaving a more lasting effect on the mind of the observer. With the help of these pictures or graphs, data can be compared easily.

There are various types of graphs. In this chapter, we shall be dealing with the following graphs:

1. Bar Graphs 2. Histogram 3. Frequency Polygon

BAR GRAPH (OR COLUMN GRAPH OR BAR CHART)

A bar graph is a pictorial representation of numerical data in the form of rectangles (or bars) of equal width and varying heights.

These rectangles are drawn either vertically or horizontally.

The height of a bar represents the frequency of the corresponding observation.

The gap between two bars is kept the same.

HISTOGRAM

A histogram is a graphical representation of a frequency distribution in an exclusive form in the form of rectangles with class intervals as bases and the corresponding frequencies as heights, there being no gap between any two successive rectangles.

METHOD OF DRAWING A HISTOGRAM

Step 1 : If the given frequency distribution is in inclusive form, convert it into an exclusive form.

Step 2 : Taking suitable scales, mark the class-intervals along x-axis and frequencies along y-axis. Note that the scales chosen for both the axes need not be the same.

Step 3 : Construct rectangles with class-intervals as bases and the corresponding frequencies as heights.

FREQUENCY POLYGON

Let $x_1, x_2, ..., x_n$ be the class marks (i.e., mid points) of the given frequency distribution and let $f_1, f_2, ... f_n$ be the corresponding frequencies. We plot the points $(x_1, f_1), (x_2, f_2),..., (x_n, f_n)$ on a graph paper and join these points by line segments. We complete the diagram in the form of a polygon by taking two more classes (called imagined classes), one at the beginning and the other at the end, each with frequency zero.

This polygon is known as the frequency polygon of the given frequency distribution.

ARTHMETIC MEAN

The average of numbers in arithmetic is known as the Arithmetic Mean or simply the mean of these numbers in statistics.

$$\text{Mean} = \frac{\text{Sum of observations}}{\text{Number of observations}}$$

MEAN OF UNGROUPED DATA

The mean of n observations $x_1, x_2, ..., x_n$ is given by

$$\text{Mean}, \bar{x} = \frac{(x_1 + x_2 + x_3 + ... + x_n)}{n} = \frac{\mathring{a} x_i}{n}$$

where the symbol Σ, called sigma stands for the summation of the terms.

MEAN FOR AN UNGROUPED FREQUENCY DISTRIBUTION

I. Direct Method

Let n observations consist of values $x_1, x_2, ..., x_n$ of a variable x, occurring with frequencies $f_1, f_2, ...$, f_n respectively.

Then, the mean of these observations is given by :

$$\text{Mean}, \bar{x} = \frac{(f_1 x_1 + f_2 x_2 + ... + f_n x_n)}{(f_1 + f_2 + ... + f_n)} = \frac{\sum f_i x_i}{\sum f_i}$$

1. Mean of ten observations $x_1, x_2, ...x_{10}$ is p. If each of the first five observations is increased by 5 and each of the next five observations is decreased by 5 then new mean is q. Find p – q.

2. If $M = \frac{x_1 + x_2 + ...x_{15}}{.15}$, then find the value of $\frac{x_1 - M}{15} + \frac{x_2 - M}{15} + \frac{x_3 - M}{15} + ... + \frac{x_{15} - M}{15}$

3. Find the length of the longest rod that can be placed in a room 30 m long, 24 m broad and 18 m high.

4. A man spends Rs. 1800 monthly on an average for the first four months and Rs. 2000 monthly for the next eight months and saves Rs.5600 in a year. Find his average monthly salary.

5. The mean of 25 observations is 18. The mean of first twelve of them is 14 and that of last twelve is 17. Find the thirteenth result.

6. In a cricket team, the average age of eleven players is 28 years. Out of these, the mean ages of three groups of three players each are 25 years, 28 years and 30 years respectvely. If in these groups the captain and the youngest player are not included, and the captain is eleven years older than the youngest player, what is the age of the captain ?

7. A team of 8 persons joins in a shooting competition. The best marksman scored 85 points. If he had scored 92 points, the average score for the team would have been 87. Find the total number of points scored by the team.

MEDIAN OF UNGROUPED DATA

Median : After arranging the given data in an ascending or a descending order of magnitude, the value of the middle-most observation is called the median of the data.

Method for Finding the Median of An Ungrouped Data

Arrange the given data in an increasing or decreasing order of magnitude. Let the total number of observations be n.

(i) If n is odd, then median = value of $\left(\frac{n+1}{2}\right)$th observation.

(ii) If n is even, then median = $\frac{1}{2}\left\{\left(\frac{n}{2}\right)\text{th observation} + \left(\frac{n}{2}+1\right)\text{th observation}\right\}$

SOLVED PROBLEMS

Ex.1 Given below are the marks obtained by 40 students in an examination :
3, 25, 48, 23, 17, 13, 11, 9, 46, 41, 37, 45, 10, 19, 39, 36, 34, 5, 17, 21, 39, 33, 28, 25, 12, 3, 8, 17, 48, 34, 15, 19, 32, 32, 19, 21, 28, 32, 20, 23.
Arrange the data in ascending order and present it as a grouped data in :
(i) Discontinuous Interval form, taking class-intervals 1 – 10, 11 – 20, etc.
(ii) Continuous Interval form, taking class-intervals 1 – 10, 10 – 20, etc.

Sol. Arranging the marks in ascending order, we get:
3, 3, 5, 8, 9, 10, 11, 12, 13, 15, 17, 17, 17, 19, 19, 19, 20, 21, 21, 23, 23, 25, 25, 28, 28, 32, 32, 32, 33, 34, 34, 36, 37, 39, 39, 41, 45, 46, 48, 48.
We may now classify them into groups as shown below:
(i) Discontinuous Interval Form (or Inclusive Form)

Marks (Class-intervals)	Tally Marks	Number of Students (frequency)
1-10	𝍸 I	6
11-20	𝍸 𝍸 I	11
21-30	𝍸 III	8
31-40	𝍸 𝍸	10
41-50	𝍸	5
Total		**40**

Note that the class 1 – 10 means, marks obtained from 1 to 10, including both.
(ii) Continuous Interval Form (or Exclusive Form)

Marks (Class-intervals)	Tally Marks	Number of Students (frequency)
1-10	𝍸	5
10-20	𝍸 𝍸 I	11
20-30	𝍸 IIII	9
30-40	𝍸 𝍸	10
40-50	𝍸	5
Total		**40**

Here, the class 1 – 10 means, marks obtained from 1 to 9, i.e., excluding 10.

Ex.2 The class marks of a frequency distribution are 7, 13, 19, 25, 31, 37, 43. Find the class-size and all the class-intervals.

Sol. Class size = Difference between two successive class-marks = (13 – 7) = 6.
Let the lower limit of the first class interval be a. Then, its upper limit = (a + 6).

$\therefore \quad \frac{a+(a+6)}{2} = 7 \Rightarrow 2a = 8 \Rightarrow a = 4$

So, the first class-interval is 4 – 10.
Let the lower limit of last class-interval be b.
Then, its upper class limit = (b + 6).

$\therefore \quad \frac{b+(b+6)}{2} = 43 \Rightarrow 2b = 80 \Rightarrow b = 40.$

So, the last class-interval is 40 – 46.
Hence, the required class-intervals are 4 – 10, 10 – 16, 16 – 22, 22 – 28, 28 – 34, 34 – 40 and 40 – 46.

Ex. 3 Convert the following frequency distribution from discontinuous to continuous form:

Marks (Class-intervals)	Frequency
1-10	7
11-20	5
21-30	9
31-40	11
41-50	6

Sol. Adjustment factor = $\frac{1}{2}$ (11 – 10) = 0.5. Subtract 0·5 from each lower limit and add 0·5 to each upper limit.

Then, the required table in continuous form may be prepared as under :

Marks (before adjustment)	Marks (after adjustment)	Frequency
1-10	0.5-10.5	7
11-20	10.5-20.5	5
21-30	20.5-30.5	9
31-40	30.5-40.5	11
41-50	40.5-50.5	6
Total		**38**

Ex.4 The monthly wages (in rupees) of 28 labourers working in a factory, are given below .-

220, 268, 258, 242, 210, 267, 272, 242, 311, 290, 300, 320, 319, 304, 302, 292, 254, 278, 318, 306, 210, 240, 280, 316, 306, 215, 256, 328.

Form a cumulative frequency table with class intervals of length 20.

Sol. We may form the table as under :

Class interval	Tally Marks	Frequency	Cumulative Frequency
210-230	IIII	4	4
230-250	III	3	7
250-270	𝍸	5	12
270-290	III	3	15
290-310	𝍸II	7	22
310-330	𝍸I	6	28

Ex.5 Given below are data showing number of students of a school using different modes of travel to school.

Mode	School Bus	Walking	Bicycle	Other Vehicles
No. of Boys	100	160	240	40
No. of Girls	180	60	120	20

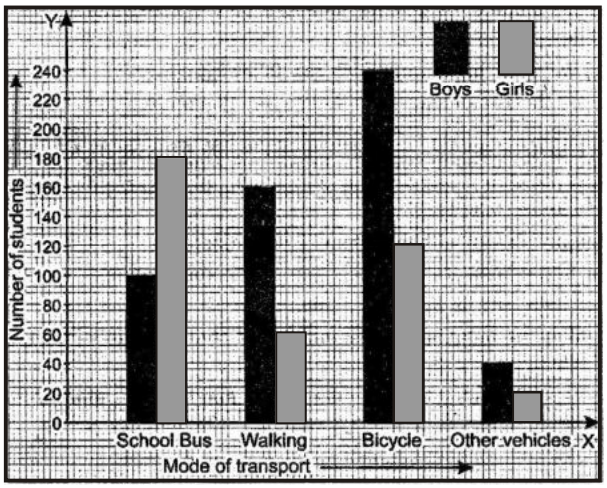
Draw a bar graph to represent the above data.

Sol. Take the mode along x-axis and the number of students along y-axis.

Scale : Along y-axis, take 1 cm = 40 students.

The bars of equal width and proportionate heights with same gap between the two consecutive bars, may be drawn as shown below.

Shading for boys and girls may be done as under :



Ex.6 Draw a histogram for the following data :

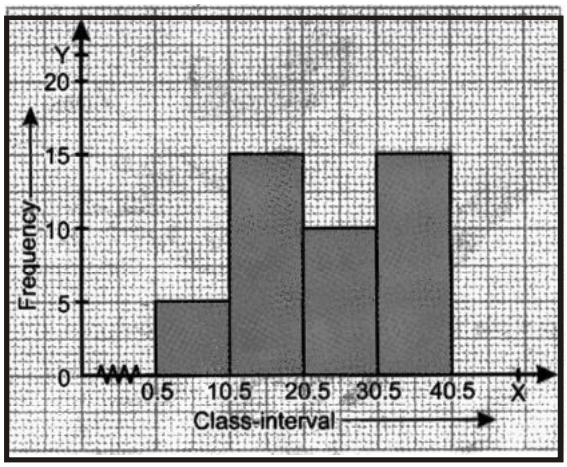
Class interval	1-10	11-20	21-30	31-40	54-60	60-70
Frequency	5	15	10	15	10	30
Cumulative Frequency	90	140	200	280	330	360

Sol. The given table is in inclusive-form. So, we first convert it into an exclusive form, as given below.

Class interval	0.5-10.5	10.5-20.5	20.5-30.5	30.5-40.5
Frequency	5	15	10	15

Now, we may draw the histogram, as shown below.

Note : Since the scale on x-axis starts at 0.5, a kink is shown near the origin.



Ex.7 Draw the frequency polygon representing the following frequency distribution.

Class interval	30-34	35-39	40-44	45-49	50-54	55-59	65	75
Frequency	12	16	20	8	10	4	2	0
Cumulative Frequency	90	140	200	280	330	360		

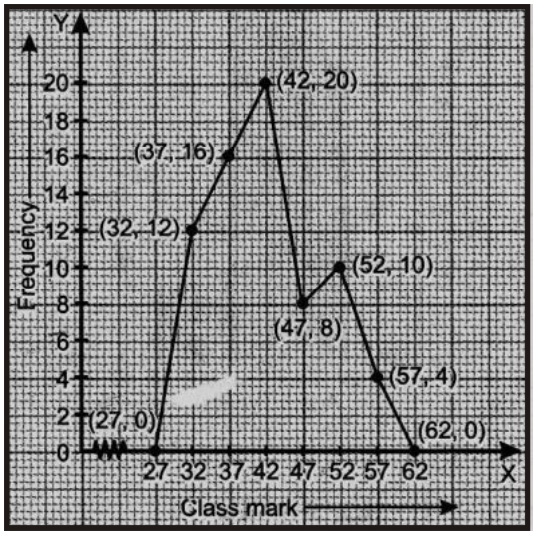
Sol. Though the given frequency table is in inclusive form, yet we find that class marks in case of inclusive and exclusive forms are the same.

We take the imagined classes 25 – 29 at the beginning and 60 – 64 at the end, each with frequency zero.

Thus, we have :

Class interval	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
Class Mark	27	32	37	42	47	52	57	62
Frequency	0	12	16	20	8	10	4	0

Now plot the points (27, 0), (32, 12), (37, 16), (42, 20), (47, 8), (52, 10), (57, 4) and (62, 0) and join them successively to obtain the required frequency polygon, as shown below :



Ex.8 The following table gives the number of doctors working in government hospitals in a city in various age groups. Draw a histogram and frequency polygon for the given data.

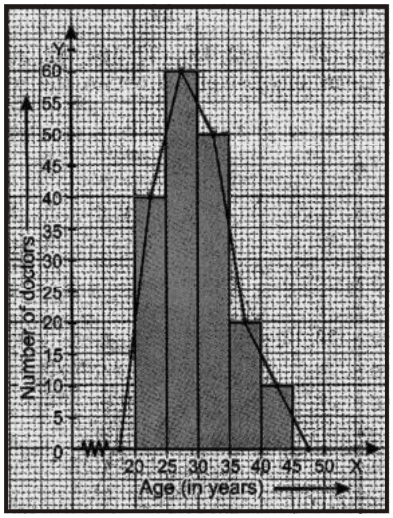
Age (in years)	20-25	25-30	30-35	35-40	40-45	50-54	55-59	60-64
Number of doctors	40	60	50	20	10	52	57	62
Frequency	0	12	16	20	8	10	4	0

Sol. **Step-1 :** Draw rectangles with bases 20–25, 25–30, 30–35, 35–40 and 40–45 and heights 40, 60, 50, 20 and 10 respectively. Since the scale on x-axis starts at 20, we make a kink in the beginning. Thus, we obtain the required histogram.

Step-2 : Mark the mid-point of the top of each rectangle of the histogram.

Step 3 : Mark the mid-points of class-intervals 15 - 20 and 45 - 50 on x-axis.

Step-4 : Join the consecutive mid-points by line segments to obtain the required frequency polygon.



Ex..9 Marks obtained by 10 students of a class are as follows:30,62,47, 25, 52, 39, 56, 66, 12, 24 Find mean of the marks obtained.

Sol. Total number of observations (N) = 10

Sum of all observations $\left(\sum_{i\ 1}^{n} x_1\right)$

= 30 + 62 + 47 + 25 + 52 + 39 +56 +66 + 12 + 24 = 413

$\therefore \quad \bar{x} = \frac{\sum_{i\ 1}^{10} x_i}{N} - \frac{413}{10} = 41.3$

Ex.10 Find the mean of first 10 prime numbers.

Sol. First 10 prime numbers are 2, 3, 5, 7, 11, 13, 17, 19, 23, 29

$\therefore \quad \sum_{i\ 1}^{10} x_i - 2, + 3 + 5 + 7 + 11 + 13 + 17$

$+ 19 + 23 + 29 = 129$

$\therefore \quad \text{Mean } (\bar{x}) = \frac{\sum_{i\ 1}^{10} x_i}{N} - \frac{129}{10} - 12.9$

Ex.11 Find the mean of the following frequency distribution.

Variable (x_i)	10	30	50	70	80
Variable (f_i)	7	8	10	15	10

Sol. for calculating the mean we prepare the following table-

X_i	F_i	$X_i F_i$
10	7	70
30	8	240
50	10	500
70	15	1050
80	10	800
Total	$\Sigma f_i = 50$	$\Sigma f_i x_i = 2660$

$$\text{Mean} = \frac{\sum f_i x_i}{\sum f_i} = \frac{2660}{50} = 53.20$$

Ex.12 Find the missing frequencies in the following frequency distribution, whose mean is 50.

X_i	10	30	50	70	90	Total
F_i	17	F_1	32	F_2	19	120

Sol. Given that $\Sigma f_i = 120$

$\Rightarrow \quad 17 + f_1 + 32 + F_2 + 19 = 120$

$\Rightarrow \quad f_1 + f_2 = 120 - 68$

$\Rightarrow \quad f_1 + f_2 = 52$

$\Rightarrow \quad f_2 = 52 - f_1$

X_i	F_i	$X_i F_i$
10	17	70
30	F_1	$30 f_1$
50	32	1600
70	$52-F_1$	$3640 - 70 f_1$
90	19	1710
Total	$\Sigma f_1 = 120$	$7120-40f_{1=} \Sigma f_i x_i$

$$\text{Mean} = \frac{\sum f_i x_i}{\sum f_i}$$

$$\Rightarrow \quad 50 = \frac{7120 - 40f_1}{120}$$

$\Rightarrow \quad 6000 = 7120 - 40f_1$

$\Rightarrow \quad 40f_1 = 1120$

$\Rightarrow \quad f_1 = 28$

$\therefore \quad f_2 = 52 - f_1 = 52 - 28 = 24$

Hence $f_1 = 28$ and $f_2 = 24$.

Median. Median is the value of middle item of a series arranged in ascending or descending order of magnitude. Unlike mean, it does not take account the values of all the items in a series, it divides the series into two parts. In one part observation values are less than median while in the other one it is more than the median. It is also called positional value. It is not effected by the least and highest values of observations. steps to find median

Step 1. Find N, the total number of observations. Arrange these observations in ascending or descending order of magnitude.

Step 2. If N is odd, median is the $\left(\frac{N+1}{2}\right)$th observation.

Step 3. If N is even, median is the mean of $\frac{N}{2}$th and $\left(\frac{N}{2}+1\right)$th observations.

Ex. 13 Find out the median of the following data :

14 13 20 21 19 23 25 16 17 25 26 30 34 36 39

Sol. Let us arrange the given observations in ascending order of magnitude as follows-

13 14 15 16 17 19 20 21 23 25 26 30 34 36 39

Here total number of observation = N = 15

$\because$ N is odd here, therefore Median (Me) = $\left(\frac{15+1}{2}\right)$th observation = 8th observation = 21.

Ex.14 Give one example of a situation in which

(i) the mean is an appropriate measure of central tendency.

(ii) the mean is not an appropriate measure of central tendency but the median is an appropriate measure of central tendency.

Sol. (i) The mean is an appropriate measure of central tendency when data is large and it is not easy to arrange it in ascending or descending order, for example if heights of 40 students of a class are given in cm, then it is appropriate to find mean for the data.

(ii) Mean is affected by extreme value for example - A General Manager's salary in a firm in Rs. 20,000 while a clerk has Rs, 5,500, a typist has Rs. 4500 and a peon has Rs. 2000. The average salary will be

$$\frac{20,000+5,500+4,500+2000}{4} - 8000 \text{ Rs.}$$

This average is not representing the data correctly as it is affected by GM's salary.

But here we find median = $\frac{5,500+4,500}{2}$ = Rs. 5000

which represents the data correctly.

Hence here the mean is not an appropriate measure of central tendency but the median an appropriate measure of central tendency.

Ex.15 The mean of 16 numbers is 8. If 2 is added to each number, what will be the new mean

Sol. Here $\bar{x}$ = 8 and N = 16

$$\therefore \quad 8 = \frac{\sum_{i\ 1}^{16} x_i}{16}$$

$$\Rightarrow \quad \sum_{i-1}^{16} x_i = 8\times16 = 128$$

Now if 2 is added to each number the new observation values are

$x_1 + 2, x_2 + 2, x_3 + 2 \ldots\ldots, x_{16} + 2,$

$$\therefore \quad \text{New mean} = \frac{\sum_{i\ 1}^{16}(x_i+2)}{16}$$

$$= \frac{(x_1+2)+(x_2+2)+(x_3+2)+\ldots+(x_{16}+2)}{16}$$

$$= \frac{\sum_{i\ 1}^{16}(x_i+2\times16)}{16} = \frac{128+32}{16} = \frac{160}{16} = 10$$

Hence the new mean is 10.

Ex.16 The mean of marks scored by 100 students was found to be 40. Later on it was discovered that a score of 53 was misread as 83. Find the correct mean.

Sol. Here N = 100, $\bar{x}$ = 40

$$\text{So, } \bar{x} = \frac{\sum_{i\ 1}^{100} x_i}{N} \Rightarrow 40 = \frac{x_1+x_2+x_3+\ldots+x_{100}}{100} \quad \Rightarrow \quad x_1 + x_2 + x_3 + \ldots. x_{100} = 4000$$

Now let x_1 was taken as 83 in place of 53

Then $83 + x_2 + x_3 + ... + x_{100} = 4000$

$\Rightarrow$ $x_2 + x_3 + ... + x_{100} = 4000 - 83$

$\Rightarrow$ $53 + x_2 + x_3 + ... + x_{100} = 4000 - 83 + 53$

$\Rightarrow$ Correct sum = 3970

$\therefore$ Correct mean $= \frac{\text{Correct sum}}{100} = \frac{3970}{100} = 39.70.$

Ex.17 The mean of 5 number is 18. If one number is excluded, their mean is 16. Find the excluded number.

Sol. N = 5, $\overline{X} = 18$

$\therefore$ $18 = \frac{\sum x_i}{5} \Rightarrow 18 = \frac{x_1 + x_2 + x_3 + x_4 + x_5}{5}$

$x_1 + x_2 + x_3 + x_4 + x_5 = 90$ ...(1)

Let x_5 be excluded, then mean is 16

$\therefore$ $\frac{x_1 + x_2 + x_3 + x_4}{4} - 16$

$\Rightarrow$ $x_1 + x_2 + x_3 + x_4 = 64$ ...(2)

Substituting value of $x_1 + x_2 + x_3 + x_4$ from equation (2) to equation (1) we get $64 + x_5 = 90$

$\Rightarrow$ $x_5 = 90 - 64$

$\Rightarrow$ $x_5 = 26$

Hence the excluded number is 26.

Ex.18 Find mode for the following distribution-

Marks	38	37	40	41	42	43	44
Frequency	26	39	20	15	13	7	5

Sol. As mode is the most frequently occurring number and here observation 37 has maximum frequency i.e., 39, therefore mode of given distribution is 37.

Ex.19 If the mean of n observations ax_1, ax_2, ax_3,..., ax_n is $a\overline{X}$, show that $(ax_1 - a\overline{X}) + (ax_2 - a\overline{X}) + ... + (ax_n - a\overline{X}) = 0$

Sol. We have $a\overline{X} = \frac{ax_1 + ax_2 + ... + ax_n}{n}$

$\Rightarrow$ $ax_1 + ax_2 + ... + ax_n = n(a\overline{X})$...(i)

Now, $(ax_1 - a\overline{X}) + (ax_2 - a\overline{X}) + ... + (ax_n - a\overline{X})$

$= (ax_1 + ax_2 + ... + ax_n) - (a\overline{X} + a\overline{X} + ... + a\overline{X})$ **n – terms**

$= n(a\overline{X}) - n(a\overline{X}) = 0.$

Ex.20 The mean of n observations $x_1, x_2, ..., x_n$ is $\overline{X}$. If (a – b) is added to each of the observations, show that the mean of the new set of observations is $\overline{X} + (a - b)$

Sol. We have,

$\overline{X} = \frac{x_1 + x_2 + ... + x_n}{n}$ ..(i)

Let $\overline{X}'$, be the mean of $x_1 + (a - b)$, $x_2 + (a - b)$, ..., $x_n + (a - b)$. Then,

$\overline{X}' = \frac{\{x_1 + (a-b)\} + \{x_2 + (a-b)\} + ... + \{x_n + (a-b)\}}{n}$

$\Rightarrow$ $\overline{X}' = \frac{x_1 + x_2 + ... + x_n + n(a-b)}{n}$ $= \overline{X} + (a - b)$ (using (i))

Ex.21 Find the sum of the deviations of the variate values 3, 4, 6, 8, 14 from their mean.

Sol. Recall that the deviations of the values x_1, x_2, x_3, ..., x_n about A are $x_1 - A$, $x_2 - A$, $x_3 - A$,..., $x_n - A$.

Let $\overline{X}$ be the mean of the values 3, 4, 6, 8, 14. Then,

$$\overline{X} = \frac{3+4+6+8+14}{5} = \frac{35}{5} = 7$$

Now, sum of the deviations of the values 3, 4, 6, 8, 14 from their mean $\overline{X} = 7$ is given by

$= (3 - 7) + (4 - 7) + (6 - 7) + (8 - 7) + (14 - 7) = -4 - 3 - 1 + 1 + 7 = 0.$

Ex.22 The mean of 40 observations was 160. It was detected on rechecking that the value of 165 was wrongly copied as 125 for computation of mean. Find the correct mean.

Sol. ∵ Here, $n = 40$, $\overline{X} = 160$

So, $\overline{X} = \frac{1}{n}\left(\sum x_i\right) \Rightarrow 160 = \frac{1}{40}\left(\sum x_i\right)$

$\Rightarrow \sum x_i = 160 \times 40 = 6400$

$\Rightarrow$ Incorrect value of $\sum x_i = 6400$

Now,

Correct value of $\sum x_i$

= Incorrect value of $\sum x_i$ − Incorrect item + Correct item

$\Rightarrow$ Correct value of $\sum x_i = 6400 - 125 + 165 = 6440$

$\therefore$ Correctmean

$$= \frac{\text{Correct value of } \sum x_i}{n} = \frac{6440}{40} = 161.$$

Ex.23 The mean of 10 numbers is 20. If 5 is subtracted from every number, what will be the new mean?

Sol. Let x_1, x_2,...,x_{10} be 10 numbers with their mean equal to 20. Then,

$$\overline{X} - \frac{1}{n}\left(\sum x_i\right)$$

$\Rightarrow 20 = \frac{x_1 + x_2 + ... + x_{10}}{10}$

$\Rightarrow x_1 + x_2 + ... + x_{10} = 200$ ..(i)

New numbers are

$x_1 - 5$, $x_2 - 5$,..., $x_{10} - 5$.

Let $\overline{X}'$ be the mean of new numbers.

Then,

$$\overline{X}' = \frac{(x_1 - 5) + (x_2 - 5) + ... + (x_{10} - 5)}{10}$$

$$\overline{X}' = \frac{(x_1 + x_2 + ... + x_{10}) - 5 \times 10}{10} = \frac{200 - 50}{10} \text{ [Using (i)]}$$

$\overline{X}' = 15$

Ex.24 The mean of 16 numbers is 8. If 2 is added to every number, what will be the new mean ?

Sol. Let $x_1, x_2, x_3, ..., x_{16}$ be 16 numbers with their mean equal to 8. Then,

$$\overline{X} = \frac{1}{n}\left(\sum x_i\right)$$

$\Rightarrow$ $8 = \frac{x_1 + x_2 + ... + x_{16}}{16}$

$\Rightarrow$ $x_1 + x_2 + ... + x_{16} = 16 \times 8 = 128$ ..(i) New numbers are $x_1 + 2, x_2 + 2, x_3 + 2, ..., x_{16} + 2$.

Let $\overline{X}'$ be the mean of new numbers. Then, $\overline{X}' = \frac{(x_1 + 2) + (x_2 + 2) + ... + (x_{16} + 2)}{16}$

$\Rightarrow$ $\overline{X}' = \frac{(x_1 + x_2 + ... + x_{16}) + 2 \times 16}{16} = \frac{128 + 32}{16}$ [Using(i)]

$\Rightarrow$ $\overline{X}' = \frac{160}{16} = 10$

Ex.25 If $x_1, x_2, ..., x_n$ are n values of a variable X such that $\sum_{i=1}^{n}(x_i - 2) = 110$ and $\sum_{i=1}^{n}(x_i - 5) = 20$. Find the value of n and the mean.

Sol. We have,

$$\sum_{i-1}^{n}(x_i - 2) = 110 \text{ and } \sum_{i-1}^{n}(x_i - 5) = 20$$

$\Rightarrow$ $(x_1 - 2) + (x_2 - 2) + ... + (x_n - 2) = 110$
and $(x_1 - 5) + (x_2 - 5) + ... + (x_n - 5) = 20$
$\Rightarrow$ $(x_1 + x_2 + ... + x_n) - 2n = 110$ and
$(x_1 + x_2 + ... + x_n) - 5n = 20$

$\Rightarrow$ $\sum_{i-1}^{n} x_i - 2n = 110$ and $\sum_{i-1}^{n} x_i - 5n = 20$

$\Rightarrow$ $S - 2n = 110$ and $S - 5n = 20$
Thus, we have
$S - 2n = 110$ ...(i)
and $S - 5n = 20$ ...(ii)
Subtracting (ii) from (i), we get
$3n = 90$
$\Rightarrow$ $n = 30$
Putting $n = 30$ in (i), we get
$S - 60 = 110$
$\Rightarrow$ $S = 170$

$\Rightarrow$ $\sum_{i-1}^{n} x_i = 170$

$\therefore$ Mean $= \frac{1}{n}\left(\sum_{i=1}^{n} x_i\right) - \frac{170}{30} - \frac{17}{3}$

Hence, n = 30 and mean $\frac{17}{3}$.

EXERCISE – I UNSOLVED PROBLEMS

Q.1 Prepare frequency table of ages of 25 students of Class IX in a school whch are given as follows :

15, 16, 16, 17, 18, 18, 17, 15, 15, 16, 16, 17, 15, 16, 16, 15, 16, 16, 15, 17, 18, 19, 16, 15, 17.

Q.2 Prepare a frequency distribution table of 25 families occupying number of rooms from the following information. No of rooms in the house kept by 25 families.

1, 2, 4, 3, 4, 2, 5, 3, 2, 2, 4, 1, 2, 3, 5, 1, 3, 5, 1, 3, 3, 1, 3, 1, 1.

Q.3 Form a frequency distribution from the following data by inclusive method taking 4 as the magnitude of class intervals taking the lowest class as 10–13.

31, 23, 19, 29, 22, 20, 16, 10, 13, 34, 38, 33, 28, 21, 15, 18, 36, 24, 18, 15, 12, 30, 27, 23, 20, 17, 14, 32, 26, 25, 18, 29, 24, 19, 16, 11, 22, 15, 17, 10.

Q.4 Form a frequency distribution of data given in Question -3 by exclusive method, taking lowest class as 6–10.

Q.5 Draw a bar diagram to represent the following figures relating to export of computer software.

Years	1997-98	1998-99	1999-00	2000-01	2001-02
Rs. (in crores)	6,500	10,940	17,150	28,350	36,500

Q.6 Draw a suitable diagram to represent the following information :

Statement of crimes in running in passenger trains

Years	1998	1999	2000	2001	2002
No. of Murders	108	131	97	102	75

Q.7 Represent the birth rates of different countries by a suitable diagram.

Country	India	Germany	UK	China	New Zealand	Sweden
Birth Rate	33	16	20	40	30	15

Q.8 Represent the given data in Histogram.

Marks	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Frequency	4	10	16	22	20	18	8	2

Q.9 Represent the following data by means of histogram.

Daily Wages (in Rs.)	10-15	15-20	20-25	25-30	30-40	40-60	60-80
No. of Workers	7	19	28	15	12	12	8

Q.10 Construct the histogram of the following data.

Marks	5-9	10-14	15-19	20-24	25-29	30-34
No. of Students	5	17	25	32	13	6

Q.11 Draw a frequency polygon of the following distribution of students obtaining marks in an examination.

Marks	10-20	20-30	30-40	40-50	50-60	50-60
No. of Students	5	12	15	22	14	4

Q.12 The marks obtained by the 40 students of a class in science (out of 100) are as follows :

50, 42, 48, 78, 83, 9, 70, 52, 43, 38, 5, 16, 20, 65, 41, 18, 24, 37, 60, 25, 18, 23, 47, 95, 17, 93, 3, 94, 6, 74, 66, 29, 13, 19, 27, 94, 80, 35, 48, 62

Form a frequency table and a cumulative frequency table with equal interals one of them being 0–10 for the data.

Q.13 We have the following data on the daily expenditure on food (in rupees) for 30 households in a locality

115, 159, 196, 205, 212, 223, 256, 271, 310, 129, 335, 169, 184, 234, 245, 241, 265, 298, 144, 135, 172, 173, 229, 243, 220, 238, 278, 243, 220, 238

(a) Obtain a frequency distribution using class intervals 100–150, 150-200,200–250, 250–300 and 300 – 350.

(b) Draw a frequency polygon.

(c) What percent of the hosueholds spend less than Rs. 250 per day, and what percent spend more than Rs. 200 per day.

Q.14 (a) Calculate the mean marks obtained by 10 students where the marks are

30, 62,47, 25, 52, 39, 56, 66, 12, 24

(b) Calculate average height of 8 students given below :

Height (in cm) : 140, 145, 147, 152, 148, 144, 150, 151

Q.15 Calculate the mean of the following series :

Size :	4	5	6	7	8	9	10
Frequency :	6	12	15	28	20	14	5

Q.16 Find out mean of sales and expenses of the following 10 firms

Firms	1	2	3	4	5	6	7	8	9	10
Sales (in thosuand rupees)	50	50	55	60	65	65	65	60	60	50
Expenses (in thosuand rupees)	11	13	14	16	16	15	15	14	13	13

Q.17 The mean marks of 100 students were found to be 40. Later on it was discovered that a score of 53 was misread as 83. Find the corrected mean corresponding to the corrected score.

Q.18 The mean salary paid to 1000 workers of a factory was found to be Rs. 180.40 Later on it was discovered that the wages of two workers were wrongly taken as 297 and 165 instead of 197 and 185.

Q.19 Calculate median of the following information :

(a) Marks : 10, 70, 50, 20, 95, 55, 42, 60, 48, 80

(b) Daily Wages (in Rs.) : 145, 130, 200, 210 198, 234, 59, 160, 257, 260, 300, 345, 360, 390.

Q.20 We have the following frequency distribution of the size of 51 households. Calculate the mean and the median.

Size :	2	3	4	5	6	7
No. of house holds :	2	3	9	21	11	5

Q.21 Find the median for the following distributions :

(a)

Serial No.	1	2	3	4	5	6	7	8	9
Values :	2	4	19	8	15	20	12	25	30

(b)

x :	5	10	15	20	25
f :	2	4	6	8	10

Q.22 Find median for the following series :

Height (in Inches)	58	59	60	61	62	63	64	65	66
No. of person	2	3	6	15	10	5	4	3	1

Q.23 Compute mode from the following series :

Size of items :	2	3	4	5	6	7
Frequency :	3	8	10	12	16	14

Q.24 Calculate mode for the following data and interpret the result :

No. of person	1	2	3	4	5	6	7	8	9	10
No. of families	24	113	120	95	60	42	21	14	5	4

Q.25 Calculate mean, median and mode from the following data.

Marks :	59	61	63	65	67	69	71	73
No. of students :	1	2	9	48	131	102	40	17

Q.26 A class consists of 50 students out of which 30 are girls. The mean of marks scored by girls in a test is 73 (out of 100) and that of boys is 71. Determine the mean score of the whole class.

Q.27 If the mean ofthe following data is 20.2, find the value of p.

x	10	15	20	25	30
f	6	8	*p*	10	6

Q.28 Ten observations 6, 14, 15, 17 x + 1, 2x – 13, 30, 32, 34, 43 are written in an ascending order. The median of the data is 24. Find the value of x.

Q.29 The mean weight of 40 students is 50 kg. One of the students leaves and is replaced by another student, which reduces the mean weight of the class by 0.5 kg. If the weight of the student who left is 65 kg, what is the weight of the student who joined the class ?

Q.30 The mean age of 30 students in a class is 14 years. 5 students with mean age of 15 years left the class. Find the mean age of remaining students.

Q.31 The class marks of distribution are :

6, 10, 14, 18, 22, 26,30

Find the class size and the class interval.

Q.32 The class marks of distribution are : 47, 52, 57, 62, 67, 72, 77, 82, 87, 92, 97, 102. Determine the class size, the class limits and the true class limits.

Q.33 Find the range of the following array of data :

70, 65, 71,36, 55, 61, 62, 41, 40, 39, 35.

Q.34 Draw the less than ogive of the following distribution table:

Class interval	0-10	10-20	20-30	30-40	40-50	50-60
Frequency	10	5	8	6	6	4

Q.35 The weights (in kilograms) of 25 students are given as follows :

Weights	35	36	37	38
Frequency	–	–	–	–

35, 38, 36, 37, 38, 35, 37, 36, 35, 38, 36, 36, 37, 37, 35, 38, 36, 35, 36, 37, 37, 38, 36, 38, 37.

Complete the following frequency table:

Q.36 The ages of ten students of a group are given below. The ages have been recorded in years and months : 8-6, 9-0, 8-4, 9-3, 7-8, 8-11, 8-7, 9-2, 7-10, 8-8

(i) What is the lowest age?

(ii) What is the highest age?

(iii) Determine the range?

Q.37 The marks scored by 55 students in a test are given below :

Marks	No. of students
0-5	2
5-10	6
10-15	13
15-20	17
20-25	11
25-30	4
30-35	2

Prepare a cumulative frequency table.

Q.38 If the heights of 5 persons are 140 cms,

150 cms, 152 cms, 158 cms and 161 cms respectively, find the mean height.

Q.39 Find the mean of all factors of 10.

Q.40 Find the mean of first 10 even natural numbers.

Q.41 Following are weights (in kg) of 10 new born babies in a hospital on a particular day :

3.4, 3.6, 4.2, 4.5, 3.9, 4.1, 3.8, 4.5, 4.4, 3.6. Find the mean $\overline{X}$.

Q.42 The number of children in 10 families of a locality are :

2, 4, 3, 4, 2, 0, 3, 5, 1, 1, 5. Find the mean number of children per family.

Q.43 Calculate the mean for the following distribution:

x :	5	6	7	8	9
f :	4	8	14	11	3

ANSWER KEY

1.

Age	15	16	17	18	19
Frequency	7	9	5	3	1

2.

No. of rooms	1	2	3	4	5
Frequency	7	5	7	3	3

3.

Class interval	10-13	14-17	18-21	22-25	26-29	30-33	34-37	38-41	Total
Frequency	5	8	8	7	5	4	3	2	40

4.

Class interval	6-10	10-14	14-18	18-22	22-26	26-30	33-34	34-38	Total
Frequency	2	4	10	7	6	5	4	2	40

12.

Classes	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100
Frequency	4	5	6	3	6	2	4	3	2	4
Cumulative frequency	4	10	16	19	25	27	31	34	36	40

13. (a)

Daily Expenditure on food (in Rs.)	100-150	150-200	200-250	250-300	300-350	Total
No. of Households	4	6	13	5	2	30

(c) 76.6% and 66.67%

14. (a) 41.3 (b) 147.12 cm **15.** 7.06

16. **Sales mean =** Rs... 58,0000 ;
Expenses mean = Rs.. 14,000

17. 39.7 **18.** Rs.. 180.32 **19.** (a) 52.7 (b) 210 **20.** mean = 5, median = 5

21. (a) 12 (b) 20 **22.** 61 **23.** 6

24. 3, Maximum number of families have 3 members

25. Mean = 67.9 ; Median = 67 ; Mode = 67. **26.** 72.2 **27.** p = 20 **28.** 20

29. 45 kg **30.** 38.3 years

31. Class size = 4, Ist Class interval = 4 – 8

32. Class size = 5, Class limit for first class = 44.5–49.5 and true class limits is same as class limits.

33. 36 **34.** C.f. (10, 15, 23, 29, 35, 39) **35.** 5, 7, 7,6

36. (i) 7 years, 8 months (ii) 9 years, 3 months (iii) 1 year, 7 months

37. cf (2, 8, 21, 38, 49, 53, 55)

38. 152.2 **39.** 4.5 **40.** 11 **41.** 4 **42.** 3 **43.** 7.025

EXERCISE – II SCHOOL EXAM/BOARD

Q.1 Discuss the meaning and scope of statistics.

Q.2 What are different types of statistical data? Which one is more reliable?

Q.3 What are the steps taken to prepare a frequency table?

Q.4 What do you mean by frequency distribution? State its advantages.

Q.5 What are the characteristics and limitations of statistics?

Q.6 Explain the following terms :
(i) Variate (ii) Array (iii) Class interval
(iv) Frequency (v) Cumulative frequency
(vi) Class limits (vii) True class limits
(viii) Class mark (ix) Class size.

Q.7 Array the data and form a frequency table for the following variables :
450, 453, 458, 459, 451, 460, 452, 453, 449, 460, 451, 454, 457, 459, 450, 459, 451, 454, 451, 459, 452, 455, 456, 458, 452, 460, 459, 555, 456, 457

Q.8 Form an array and prepare a frequency table for the following values of annual gold output (in lakhs kg) for 20 different years :
94, 95, 96, 93, 87, 89, 93, 89, 87, 88, 95, 96, 92, 87, 88, 90, 92, 91, 90, 94

Q.9 The marks obtained by 30 students, out of 10 are :
2, 1, 6, 8, 4, 3, 0, 3, 3, 9, 5, 8, 1, 6, 7, 5, 0, 4, 4, 7, 3, 4, 2, 3, 3, 2, 7, 2, 4, 5
Array the data and form the frequency distribution.

Q.10 The following data gives the weight (in grams) of 30 oranges picked from a basket: 106, 107, 76, 109, 187, 95, 125, 92, 70, 139, 128, 100, 88, 84, 99, 113, 204, 141, 136, 123, 90, 115, 110, 97, 90, 107, 75, 80, 118, 82
Construct a grouped frequency distribution taking classes of equal width 20 in such a way that the mid value of the first class is 70.
From the frequency table, find the number of oranges whose weights are (i) less than 100 gms (ii) more than 180 gms.

Q.11 Time taken in seconds by 25 students to solve a question is given below :
20, 16, 20, 26, 27, 28, 30, 33, 37, 50, 40, 42, 46, 38, 43, 46, 46, 48, 49, 53, 58, 59, 60, 64, 52
By taking class interval of 10 seconds, make a frequency table.

Q.12 Construct a frequency distribution table for the following data of marks obtained by 25 students in a test in Mathematics in a school. Take 20 – 30 (30 not included) as one of the classes :
9, 25, 17, 12, 28, 20, 7, 31, 14, 43, 11, 19, 23, 37, 6, 24, 48, 10, 32, 17, 40, 31, 18, 24, 29. Now find the following:
(i) the number of students getting less than 40 marks.
(ii) the number of students getting 30 or more marks.

Q.13 Find the class mark of the class 11 – 19

Q.14 Find the class mark of the class 8·5 – 15·5.

Q.15 If the class marks of a distribution are 32, 39, 46, 53, find the width of each class.

Q.16 If the class marks of a frequency distribution are 20, 25, 30, 35, 40 and 45, find the classes and their width.

Q.17 If the class marks of a frequency distribution are 19·5, 26·5, 33·5, 40·5, 47·5, 54·5, 61·5 then find the size of the class and the classes.

Q.18 The class marks of a distribution are 11, 14, 17, 20, 23, 26, and 29. Find the width of the class and the true class limits.

Q.19 The class marks of a distribution are 2·03, 2·23, 2·43, 2·63, 2·83, 3·03 and 3·23 Determine the class size and the class boundaries.

Q.20 Find the true class limits of 6 – 10, 11 – 15, 16 – 20, 21 – 25, 26 – 30, 31 – 35

Q.21 The distances (in km) covered by 24 cars in 2 hours are given below:
125, 140, 128, 108, 96, 149, 136, 112, 84, 123, 130, 120, 103, 89, 65, 103, 145, 97, 102, 87, 67, 78, 98, 126
Represent the data as a cumulative frequency table using 60 as the lower limit of the first group and all the classes of class size 15.

Q.22 In a study of diabetic patients, the following data are obtained :

Age (in year)	No. of diabetic patients
10-20	3
20-30	6
30-40	14
40-50	9
50-60	5
60-70	2

Construct a cumulative frequency table for the above data.

Q.23 The ages of workers in a factory are as follows:

Age (in year)	No. of workers
21-23	3
23-25	4
25-27	5
27-29	6
29-31	5
31-33	4
33-35	3

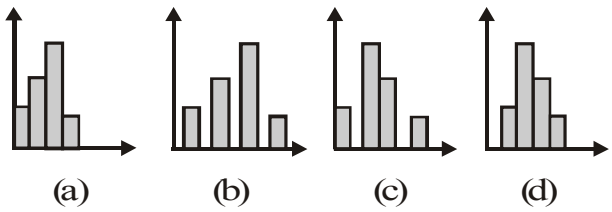
Construct a cumulative frequency table for the above data.

Q.24 The following data represents the cumulative frequency distribution of daily earnings of 100 labourers in a factory :

Earnings (in rupees)	No. of labourers
Less than 62	15
Less than 74	22
Less than 86	35
Less than 98	60
Less than 110	100

Contruct a frequency table from the above data.

Q.25 From the figures given below, write which of the following are histograms?



Q.26 Subjects offered by the number of students in a school is given below :

Subject	Maths	Hindi	Eng.	G.Sc.	Soc. St.
No. of students	50	40	70	60	60

Draw a bar graph to depict the above data.

Q.27 Daily sales (in Rs) of Sushil Enterprises from Marth to August are given below

Month	March	April	May	June	July	August
Sale (in Rs)	2000	2500	4500	3000	4000	3500

Draw a bar graph to depict the above data.

Q.28 Following table gives the birth rate per thousand of different countries over a certain period :

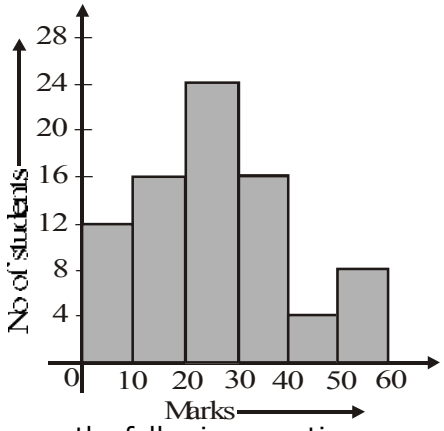
Country	India	Germany	U.K.	China	Sweden
Birth rate	33	16	20	40	15

Represent the above data by a bar graph.

Q.29 Draw a bar graph to represent the following figures relating to manufacture of sewing machines :

Year	1999	2000	2001	2002	2003	2004	2005
No. of sewing machines	1000	1500	2000	3000	2500	2000	3500

Q.30 Histogram for the marks obtained by 80 students in a test, is given in Fig.



Answer the following questions:

(i) How many students obtained marks between 20 and 30 ?

(ii) How many students obtained marks less than 20 ?

(iii) How many students obtained marks not less than 40?

Q.31 Find the arithmetic mean of 17, 20, 18, 15, 24 and 23.

Q.32 In a cricket test match the scores of ten players are : 85, 32, 0, 54, 29, 101, 73, 64, 29 and 36. Find the mean of the runs.

Q.33 In a zonal athletic long jump meet the distances jumped by 10 atheletes are: 205cm, 200 cm, 275 cm, 260 cm, 259 cm, 199 cm, 252 cm, 239 cm, 228 cm and 281 cm. Find the arithmetic mean of the jumps.

Q.34 Find the mean of first ten odd natural numbers.

Q.35 Calculate the mean for the weekly pocket expenses of students given below :

Pocket Expenses (in Rs)	45	40	59	71	58	47	65	35-40
Frequency	7	4	10	6	3	8	1	5

Q.36 Find the mean of x, x + 2, x + 4, x + 6 and x + 8.

Q.37 If the arithmetic mean of 6, 8, 5, 7, x and 4 is 7, find the value of x.

Q.38 The mean of 15 observations is 20. If 8 is added to each observation, find the new mean.

Q.39 The mean of 27 observations is 35. If 5 is subtracted from each observation, what will be the new mean?

Q.40 The mean of 53 observations is 18. If each observation is multiplied by 3, what will be the new mean ?

Q.41 The traffic police recorded the speed (in km/h) of 10 motorists as 47, 53, 49, 60, 39, 42, 55, 57, 52, 48. Later on an error in the recording instrument was found. Find the correct average speed of the motorists if the instrument recorded the speed 5 km/h less in each case.

Q.42 The mean of 25 observations is 16. If 4 is added to each of the first 10 observations, find the mean of the new set of 25 observations.

Q.43 The mean height of 15 students is 154 cm. It is discovered later on that while calculating the mean, the item 175 cm was read as 145 cm. Find the correct mean height.

Q.44 Mean of 25 observations was found to be 78·4. But later on it was discovered that 96 was misread as 69. Find the correct mean.

Q.45 The mean marks of 25 students of X A in Board examination is 67 and that of 30 students of X B is 75. Find the mean of the marks of all the 55 students correct to one decimal place.

Q.46 The average weight of 33 students of a class is 52 kg. The average weight of 18.of them is 48 kg. Find the average weight of the remaining students.

Q.47 The mean monthly salary of the 12 employees of a firm is Rs 1450. If one more person joins the firm who gets Rs 1645 per month, what will be the mean monthy salary of 13 employees?

Q.48 For the numbers 9·6, 5·2, 3·5, 1·5, 1·6, 2·4, 2·6, 8·4, 10·3, 10·9, verify that $\Sigma(x - \bar{x}) = 0$.

Q.49 The average of 15 results is 50. If the average of first 8 results is 48 and that of the last 8 is 53, find the eighth result.

Select the correct alternative for each of the following (50 – 53) :

Q.50 If each variate of a data is increased by 5, then arithmetic mean
(i) remains the same
(ii) is 5 times the original mean
(iii) is increased by 5
(iv) is decreased by 5

Q.51 Mean of a set of observations is the value which
(i) occurs most frequently
(ii) divides observations into two equal parts
(iii) is the sum of the observations
(iv) is a representative of the whole group

Q.52 Mode of a set of observations is the value which
(i) occurs most frequently
(ii) divides the observations into two equal parts
(iii) is the mean of the middle two observations
(iv) is the sum of the observations.

Q.53 Mode of the observations 5, 7, 2, 8, 5, 5, 8, 2, 5, 8, 7, 6 is
(i) 7 (ii) 6
(iii) 6.5 (iv) 5

Q.54 Find the median of each of the following data :
(i) 7, 10, 5, 20, 18, 25, 17
(ii) 3, 5, 9, 2, 8, 7, 6, 7, 4
(iii) 37, 42, 31, 46, 25, 27, 30, 32, 41

Q.55 Find the median of the following items :
(i) 5, 8, 16, 12, 11, 15, 10, 13, 6, 18, 20
(ii) 133, 73, 89, 108, 94, 140, 94, 86, 75, 135, 146

Q.56 Find the median of each of the following data :
(i) 12, 17, 3, 14, 5, 8, 7, 15
(ii) 25, 24, 26, 30, 27, 35, 24, 29
(iii) 25, 29, 35, 32, 46, 27, 24, 31, 23, 40
(iv) 25,34,31, 23, 22, 26, 35, 29, 20, 32

ANSWER KEY

7. 449, 450, 450, 451, 451, 451, 451, 452, 452, 452, 453, 453, 454, 454, 455, 456, 456, 457, 457, 458, 458, 459, 459, 459, 459, 459, 460, 460, 460, 555

Value of variable	Frequency
449	1
450	2
451	4
452	3
453	2
454	2
455	1
456	2
457	2
458	2
459	5
460	3
555	1

8. 87, 87, 87, 88, 88, 89, 89, 90, 90, 91, 92, 92, 93, 93, 94, 94, 95, 95, 96, 96

Annual gold output (in lakhs kg)	Frequency
87	3
88	2
89	2
90	2
91	1
92	2
93	2
94	2
95	2
96	2

9. 0, 0, 1, 1, 2, 2, 2, 2, 3, 3, 3, 3, 3, 3, 4, 4, 4, 4, 4, 5, 5, 5, 6, 6, 7, 7, 7, 8, 8, 9.

Marks	No. of Students
0	2
1	2
2	4
3	6
4	5
5	3
6	2
7	3
8	2
9	1

10.

Weight (in gms)	No. of Oranges
60-80	3
80-100	10
100-120	9
120-140	5
140-160	1
160-180	0
180-200	1
200-220	1

(i) 13 (ii) 2

11.

Seconds	No. of Students
15-25	3
25-35	5
35-45	5
45-55	8
55-65	4

12.

Marks obtained	No. of students
0-10	3
10-20	8
20-30	7
30-40	4
40-50	3

(i) 22 (ii) 7

13. 15 **14.** 12 **15.** 7

16. 17.5-22.5, 22.5-27.5, 27.5-32.5, 32.5-37.5, 37.5-42.5, 42.5-47.5, width of the class is 5

17. 16-23, 23-30, 30-37, 37-44, 44-51, 51-58, 58-65, size of the class is 7.

18. Width of the class is 3, true class limit are 9.5-12.5, 12.5-15.5, 15.5-18.5, 18.5-21.5, 21.5-24.5, 24.5-27.5, 27.5-30.5

19. Class size is 0.20. Class boundaries are 1.93-2.13, 2.13-2.33, 2.33-2.53, 2.53-2.73, 2.73-2.93, 2.93-3.13, 3.13-3.33.

20. True class limits are 5.5-10.5, 10.5-15.5, 15.5-20.5, 20.5-25.5, 25.5-30.5, 30.5-35.5.

21. Lowest value - 65 and Highest value - 149

CI	f	c.f
60 – 75	2	2
75 – 90	4	6
90 – 105	6	12
105 – 120	3	15
120 – 135	5	20
135 – 150	4	24

22. C.f (3, 9, 23, 32, 37, 39)

23. C.f (3, 7, 12, 18, 23, 27, 30)

24.

C.I	50 – 62	62 – 74	74 – 86	86 – 98	90 – 110
f	15	7	13	25	40

25. (a) and (d)

30.

Marks	No. of students
0 – 10	12
10 – 20	16
20 – 30	24
30 – 40	16
40 – 50	4
50 – 60	8

(i) 24 (ii) 28 (iii) 12

31. 19.5 **32.** 50.3 runs

33. 239.8 cm **34.** 10

35. 54 **36.** x + 4

37. 12 **38.** 28

39. 30 **40.** 54

41. 55.2 km/hr **42.** 17.6

43. 156 cm **44.** 79.48

45. 71.4 marks **46.** 56.8 kg

47. Rs.1465 **49.** 58

50. (iii) **51.** (iv)

52. (i) **53.** (iv)

54. (i) 17 (ii) 6 (iii) 32

55. (i) 12 (ii) 94

56. (i) 10 (ii) 26.5 (iii) 30 (iv) 27.5

EXERCISE – III MULTIPLE CHOICE QUESTIONS

Q.1 The lower limit of the class interval 44 – 55 is

(A) 44 (B) 55

(C) 43.5 (D) 54.5

Q.2 The frequency of 3 in the following observations : 4, 3, 6, 3, 4, 5, 7, 3, 3, 6, 5, 7, 8

(A) 2 (B) 0

(C) 4 (D) 3

Q.3 In the following table the marks secured by Class IX students are given

Marks	Below 10	Below 20	Below 30	Below 40	Below 50
Number of students	3	7	25	35	55

In the above distribution, the class interval of marks of maximum frequency is :

(A) 20 – 30 (B) 30 – 40

(C) 40 – 50 (D) 0 – 10

Q.4 The weight of 10 persons are as follows :

70, 50, 72, 62, 76, 72, 64, 58, 90, 71

The arithmetic mean of these weights is :

(A) 68.5 (B) 60

(C) 67.5 (D) 80

Q.5 If arithmetic mean of 4, 7, 9, y is 7, then y =

(A) 5 (B) 6

(C) 7 (D) 8

Q.6 In a histogram, the middle points of the upper sides of the rectangles are joined by straight lines in order. The figure thus obtained is called a

(A) frequency curve

(B) cumulative frequency curve

(C) frequency polygon

(D) none of these

Q.7 There are eleven question in a paper. A student secured 8, 3, 5, 5, 9, 0, 7, 4, 6, 6, 2 marks in these questions. The median of these marks is

(A) 4 (B) 5

(C) 6 (D) 8

Q.8 The mode of 6, 6, 6,6, 5, 5, 8, 7, 7, 9 is :

(A) 3 (B) 4

(C) 5 (D) 6

Q.9 The mid point of the class interval 25 – 30 is :

(A) 25 (B) 30

(C) 27.5 (D) 29

Q.10 By arranging the marks of students in ascending or descending order, the central measure determined is

(A) mean (B) median

(C) mode (D) none of these

Q.11 In a class, the number of absentees for 7 days is 4, 6, 3, 5, 8, 13, 14. Then 6 is the

(A) median (B) mean

(C) mode (D) none of these

Q.12 The value of x for which 5 is the mode of the following observations : 3, 4, 5, 7, 7, 5, 4, x is

(A) 3 (B) 5

(C) 7 (D) none of these

Q.13 Following are the marks obtained by 10 students in English and are arranged in ascending order 3, 15, 17, 20, x, x + 2, 27, 30, 35, 49. If 25 is the median of given data, the value of x is

(A) 25 (B) 23

(C) 24 (D) none of these

Q.14 Following are the marks obtained by 5 students of a class 35, 48, 20, 25, 30. If marks of each students be increased by 2, the mean marks will

(A) increase by 2 (B) decrease by 2

(C) increase by 5 (D) remain the same

Q.15 Let the mean of a set of given observations be m. If each observation is multiplied by k, the new mean would be

(A) m + k (B) m × k

(C) $\frac{m}{k}$ (D) none of these

Q.16 The class mark of the class 90 – 120 is

(A) 90 (B) 105

(C) 115 (D) 120

Q.17 The range of the data :

25, 18, 20, 22, 16, 6, 17, 15, 12, 30 ,32, 10, 19, 8, 11, 20 is

(A) 10 (B) 15

(C) 18 (D) 26

Q.18 In a frequency distribution, the mid value of a class is 10 and the width of the class is 6. The lower limit of the class is :

(A) 6 (B) 7

(C) 8 (D) 12

Q.19 To draw a histogram to represent the following distribution :

Class	5 - 10	10 - 15	15 - 25	25 - 45	45 - 75
Frequency	6	12	10	8	15

the adjusted frequency for the class 25 – 45 is :

(A) 6 (B) 5

(C) 3 (D) 2

Q.20 The mean of five numbers is 30. If one number is excluded, their mean becomes 28. The excluded number is :

(A) 28 (B) 30

(C) 35 (D) 38

Q.21 If the mean of the observation

x, x + 3, x + 5, x + 7, x + 10 is 9, the mean of last three observations is

(A) $10\frac{1}{3}$ (B) $10\frac{2}{3}$

(C) $11\frac{1}{3}$ (D) $11\frac{2}{3}$

Q.22 If each obsevation of the data is increased by 5, then their mean :

(A) remains the same

(B) becomes 5 times the original mean

(C) is decrease by 5

(D) is increased by 5

Q.23 Let $\bar{x}$ be the mean of $x_1, x_2 \ldots\ldots\ldots x_n$ and $\bar{y}$ the mean of $y_1, y_2, \ldots\ldots y_n$. If $\bar{z}$ is the mean of $x_1, x_2, \ldots\ldots x_n; y_1, y_2, \ldots y_n$ then $\bar{z}$ =

(A) $\bar{x}+\bar{y}$ (B) $\frac{\bar{x}+\bar{y}}{2}$

(C) $\frac{\bar{x}+\bar{y}}{n}$ (D) $\frac{\bar{x}+\bar{y}}{2n}$

Q.24 The mean of 100 observations is 50. If one of the observation which was 50 is replaced by 150, the resulting mean will be :

(A) 50.5 (B) 51

(C) 51.5 (D) 52

Q.25 There are 50 numbers. Each number is subtracted from 53 and the mean of the numbers so obtained is found to be –3.5. The mean of the given numbers is :

(A) 46.5 (B) 49.5

(C) 53.5 (D) 56.5

Q.26 The range of the data 12, 25, 15, 18, 17, 20, 22, 6, 16, 11, 8, 19, 10, 30, 20, 32 is

(A) 10 (B) 15

(C) 18 (D) 26

Q.27 The class mark of the class 100–120 is

(A) 100 (B) 110

(C) 115 (D) 120

Q.28 In the class intervals 10–20, 20–30, the number 20 in included in

(A) 10–20

(B) 20–30

(C) in each of 10–20 and 20–30

(D) in none of 10–20 and 20–30

Q.29 The class marks of a frequency distribution are 15, 20, 25, 30,.... The class corresponding to the class mark 20 is

(A) 12.5 –17.5 (B) 17.5 –22.5

(B) 18.5 –21.5 (D) 19.5 –20.5

Q.30 In a frequency distribution, the mid-value of a class is 10 and width of each class is 6. The lower limit of the class is

(A) 6 (B) 7

(C) 8 (D) 12

Q.31 Let m be the midpoint and u be the upper class limit of a class in a continuous frquency distribution. The lower class limit of the class is

(A) 2m – u (B) 2m + u
(C) m – u (D) m + u

Q.32 The width of each of the five continuous classes in a frequency distribution is 5 and the lower class limit of the lowest class is 10. The upper class limit of the highest class is

(A) 45 (B) 25
(C) 35 (D) 40

Q.33 Let L be the lower class boundary of a class in a frequency distribution and m be the midpoint of the class. Which one ofthe following is the upper class boundary of the class ?

(A) $m+\frac{(m+L)}{2}$ (B) $L+\frac{m+L}{2}$
(C) 2m – L (D) m – 2L

Q.34 The mid value of a class interval is 42 and the class size is 10. The lower and upper limits are

(A) 37–47 (B) 37.5–47.5
(C) 36.5–47.5 (D) 36.5–46.5

Q.35 If the mean of five observations x, x + 2, x + 4, x + 6 and x + 8 is 11, then the value of x is

(A) 5 (B) 6
(C) 7 (D) 8

Q.36 If the mean of x, x + 3, x + 5, x + 7, x + 10 is 9, the mean of the last three observations is

(A) $10\frac{1}{3}$ (B) $10\frac{2}{3}$
(C) $11\frac{1}{3}$ (D) $11\frac{2}{3}$

Q.37 If $\bar{x}$ is the mean of $x_1, x_2, x_3,.....x_n$, then $\sum_{i=1}^{n}(x_i-\bar{x})$ = ?

(A) –1 (B) 0
(C) 1 (D) n – 1

Q.38 If each observation of data is increased by 5, then their mean
(A) remains the same
(B) becomes 5 times the original mean
(C) is decreased by 5
(D) is increased by 5

Q.39 Let $\bar{x}$ be the mean of $x_1, x_2,....x_n$ and $\bar{y}$ be the mean of $y_1, y_2,...y_n$. If $\bar{z}$ is the mean of $x_1, x_2,....x_n, y_1, y_2,....y_n$, then $\bar{z}$ = ?

(A) $(\bar{x}+\bar{y})$ (B) $\frac{1}{2}(\bar{x}+\bar{y})$
(C) $\frac{1}{n}(\bar{x}+\bar{y})$ (D) $\frac{1}{2n}(\bar{x}+\bar{y})$

Q.40 If $\bar{x}$ is the mean of $x_1, x_2,... x_n$, then for $a\neq 0$, the mean of $ax_1, ax_2,....ax_n, \frac{x_1}{a}, \frac{x_2}{a},...., \frac{x_n}{a}$ is

(A) $\left(a+\frac{1}{a}\right)\bar{x}$ (B) $\left(a+\frac{1}{a}\right)\frac{\bar{x}}{2}$
(C) $\left(a+\frac{1}{a}\right)\frac{\bar{x}}{n}$ (D) $\frac{\left(a+\frac{1}{a}\right)\bar{x}}{2n}$

Q.41 If $\bar{x}_1, \bar{x}_2 ,.... \bar{x}_n$ are the means of n groups with $n_1, n_2,....n_n$ number of observations respectively, then the mean $\bar{x}$ of all the groups taken together is

(A) $\sum_{i=1}^{n} n_1\bar{x}_i$ (B) $\frac{\sum_{i=1}^{n} n_i\bar{x}_i}{n^2}$
(C) $\frac{\sum_{i=1}^{n} n_i\bar{x}_i}{\sum_{i=1}^{n} n_1}$ (D) $\frac{\sum_{i=1}^{n} n_i\bar{x}_i}{2n}$

Q.42 The mean weight of six boys in a group is 48 kg. The individual weights of five of them are 51 kg, 45 kg, 49 kg, 46 kg and 44 kg. The weight of the 6th boy is

(A) 52 kg (B) 52.8 kg
(C) 53 kg (D) 47 kg

Q.43 The mean of the marks scored by 50 students was found to be 39. Later on it was discovered that a score of 43 was misread as 23. The correct mean is

(A) 38.6 (B) 39.4
(C) 39.8 (D) 39.2

Q.44 The mean of 100 items was found to be 64. Later on it was discovered that two items were mirread as 26 and 9 instead of 36 and 90 respectively. The correct mean is

(A) 64.86 (B) 65.31
(C) 64.91 (D) 64.61

Q.45 The mean of 100 observations is 50. If one of the observations 50 is replaced by 150, the resulting mean will be

(A) 50.5 (B) 51
(C) 51.5 (D) 52

Q.46 The mean of 25 observations is 36. Out of these observations, the mean of first 13 is 32 and that of the last 13 is 40. The 13th observation is

(A) 23 (B) 36
(C) 38 (D) 40

Q.47 There are 50 numbers. Each number is subtracted from 53 and the mean of the numbers so obtained is found to be –3.5. The mean of the given numbers is

(A) 46.5 (B) 49.5
(C) 53.5 (D) 56.5

Q.48 The mean of the following data is 8.

x	3	5	7	9	11	13
y	6	8	15	p	8	4

The value of p is

(A) 23 (B) 24
(C) 25 (D) 21

Q.49 The runs scored by 11 members of a circket team are 15, 34, 56, 27, 43, 29, 31, 13, 50, 20, 0. The median score is

(A) 27 (B) 29
(C) 31 (D) 20

Q.50 The weight of 10 students (in kgs) are
55, 40, 35, 52, 60, 38, 36, 45, 31, 44
The median weight is

(A) 40 kg (B) 41 kg
(C) 42 kg (D) 44 kg

Q.51 The median of the numbers 4, 4, 5, 7, 6, 7, 7, 12, 3, is

(A) 4 (B) 5
(C) 6 (D) 7

Q.52 The median of the numbers 84, 78, 54, 56, 68, 22, 34, 45, 39, 54 is

(A) 45 (B) 49.5
(C) 54 (D) 56

Q.53 Mode of the data 15, 17, 15, 19, 14, 18, 15, 14, 16, 15, 14, 20, 19, 14, 15 is

(A) 14 (B) 15
(C) 16 (D) 17

Q.54 For drawing a frequency polygon of a continuous frequency distribution, we plot the points whose ordinates are the frequencies of the respective classes and abscissae are respectively

(A) upper limits of the classes
(B) lower limits of the classes
(C) class marks of the classes
(D) upper limits of preceding classes

Q.55 The marks obtained by 17 students of a class in a test (out of 100) are given below :
90, 79, 76, 82, 46, 64, 72, 49, 68, 66, 48, 91, 82, 100, 96, 65, 84, The range of the data is

(A) 46 (B) 54
(C) 90 (D) 100

Q.56 The class mark of the class 130–150 is

(A) 130 (B) 135
(C) 140 (D) 145

Q.57 The mean of five numbers is 30. If one number is excluded, their mean becomes 28. The excluded number is

(A) 28 (B) 30
(C) 35 (D) 38

Q.58 The median of the data arranged in ascending order 8, 9, 12, 18, (x + 2), (x + 4), 30, 31, 34, 39, is 24. The value of x is

(A) 22 (B) 21
(C) 20 (D) 24

Q.59 Consider the following statement :
If in a frequency table, the class intervals are 40-44, 45-49, 50-54, etc., then when made continuous, they will be 39.5-44.5, 44.5-49.5, 49.5-54.5 etc. This statement is
(A) wrong as 40-44 actually means 40-44.999... etc and hence when made continuous, they will be 40-45, 45-50, 50-55 etc.
(B) wrong as there are no readings between 44 and 45, between 49 and 50 etc and hence the correct intervals are 40-44, 45-49 etc.
(C) correct. Although the interval is actually 40-45 etc., there is the possibility of recording errors at each interval, namely 40, 45, 50 etc. and hence the intervals should be taken as 39.5-44.5, 44.5-49.5, 49.5-54.5 etc.
(D) correct, because the mid-values of 40-44, 45-49, 50-54 etc. and 39.5-44.5, 44.5-49.5, 49.5-54.5 etc. are the same.

Q.60 In a frequency distribution, the mid value of a class is 15 and the class size is 4. The lower limit of the class is :

(A) 10 (B) 12

(C) 13 (D) 14

Q.61 The mid value of a class interval is 42. If the class size is 10, then the upper and lower limits of the class are :

(A) 47 & 37 (B) 37 & 47

(C) 37.5 & 47.5 (D) 47.5 & 37.5

Q.62 If the arithmetic mean of 7, 5, 13, x and 9 be 10, then the value of x is :

(A) 10 (B) 12

(C) 14 (D) 16

Q.63 Consider the table given below :

Marks	0-10	10-20	20-30	30-40	40-50	50-60
Number of Students	12	18	27	20	17	6

The arithmetic mean of the marks given above, is :

(A) 18 (B) 28

(C) 27 (D) 6

Q.64 The arithmetic mean of 5 numbers is 27. If one of the numbers be excluded, their mean is 25. The excluded number is :

(A) 28 (B) 26

(C) 25 (D) 35

Q.65 The combined mean of three groups is 12 and the combined mean of first two groups is 3. If the first, second and third groups have 2, 3 and 5 items respectively, then mean of third group is:

(A) 10 (B) 21

(C) 12 (D) 13

Q.66 Mode is :

(A) Least frequent value

(B) Middle most value

(C) Most frequent value

(D) None of these

Q.67 The following is the data of wages per day 5, 4, 7, 5, 8, 8, 8, 5, 7, 9, 5, 7, 9, 10, 8 The mode of the data is :

(A) 7 (B) 5

(C) 8 (D) 10

Q.68 The mode of the given distribution is :

Weight (in kg)	40	43	46	49	52	55
Number of Children	5	8	16	9	7	3

(A) 40 (B) 46

(C) 55 (D) None of these

Q.69 The median of

0, 2, 2, 2, –3, 5, –1, 5, 5, –3, 6, 6, 5, 6 is :

(A) 0 (B) –1.5

(C) 2 (D) 3.5

Q.70 The median of the following distribution is :

Class-interval	35-45	45-55	55-65	65-70
Frequency	8	12	20	10

(A) 56.5 (B) 57.5

(C) 58.7 (D) 59

Q.71 The correct formula is :

(A) Median + A.M. = 2 × Mode

(B) Median – A.M. = Mode

(C) 3(A.M.) – 2(Median) = Mode

(D) 3(Median) – 2(A.M.) = Mode

Q.72 The mode of the following frequency distribution is :

Class interval	3-6	6-9	9-12	12-15	15-18	18-21	21-24
Frequency	2	5	21	23	10	12	3

(A) 11.5 (B) 12.4

(C) 12 (D) 11.8

Q.73 A, B, C are three sets of values of x :

A : 2, 3, 7, 1, 3, 2, 3,

B : 7, 5, 9, 12, 5, 3, 8

C : 4, 4, 11, 7, 2, 3, 4

Select the correct statement from among the following :

(A) Mean of A is equal to Mode of C

(B) Mean of C is equal to Median of B

(C) Median of B is equal to Mode of A

(D) Mean, Median and Mode of A are same

Q.74 The average value of the median of 2, 8, 3, 7, 4, 6, 7 and the mode of 2, 9, 3, 4, 9, 6, 9 is :

(A) 9 (B) 8

(C) 7.5 (D) 6

Q.75 The average weight of a group of 20 boys was calculated to be 89.4 kg and it was later discovered that one weight was misread as 78 kg instead of the correct one of 87 kg, then the correct average weight is :

(A) 88.95 kg (B) 89.25 kg

(C) 89.55 kg (D) 89.85 kg

Q.76 The median of the following in complete frequency distribution is 4.

x	1	2	3	4	5	6	7	8
Frequency	2	3	4	5	6	7	8	—

The frequency of 8 is :

(A) 1 (B) 2

(C) 3 (D) 4

Q.77 Mean of first n natural numbers is -

(A) $\frac{n(n-1)}{2}$ (B) $\frac{n(n+1)}{2}$

(C) $\frac{(n+1)}{2n}$ (D) $\frac{n+1}{2}$

Q.78 $(x_1 - \bar{x}) + (x_2 - \bar{x}) + \ldots + (x_n - \bar{x}) =$

(A) 0 (B) 1

(C) $\bar{x}$ (D) None of these

Q.79 A factory employs 100 workers of whom 60 work in the first shift and 40 work in the second shift. The average wage of all the 100 workers is Rs.38. If the average wage of 60 workers of the first shift is Rs.40, then the average wage of the remaining 40 workers of the second shift is -

(A) 35 (B) 40

(C) 45 (D) None of these

Q.80 The median of the items 6, 10, 4, 3, 9, 11, 22, 18 is -

(A) 9 (B) 10

(C) 9.5 (D) 11

Q.81 If median = (mode + 2 mean) M, then M is equal to -

(A) 3 (B) 1/3

(C) 2 (D) None of these

Q.82 Which of the following is not a measure of central tendency :

(A) Mean (B) Median

(C) Mode (D) Range

Q.83 If $\bar{x}$ is the mean of a set of n observations $x_1, x_2, x_3, \ldots, x_n$ then $\sum_{i=1}^{n}(x_i - \bar{x})$ is equal to

(A) M.D. about mean

(B) S.D.

(C) 0

(D) None of these

Q.84 If the mean of 3, 4, x , 7, 10 is 6, then the value of x is -

(A) 4 (B) 5

(C) 6 (D) 7

Q.85 The mean of a set of numbers is $\bar{x}$. If each number is increased by λ, the mean of the net set is -

(A) $\bar{x}$ (B) $\bar{x} + \lambda$

(C) $\lambda\ \bar{x}$ (D) None of these

Q.86 The mean of a set of numbers is $\bar{x}$. If such number is multiplied by λ, then the mean of the new set is -

(A) $\bar{x}$ (B) $\lambda + \bar{x}$

(C) $\lambda\bar{x}$ (D) None of these

Q.87 The mean of first n natural numbers is -

(A) $\frac{n(n+1)}{2}$ (B) n (n + 1)

(C) $\frac{n+1}{2}$ (D) (n + 1)

Q.88 The mean of the squares of first n natural numbers is -

(A) $\frac{1}{2}n^2$

(B) $\frac{1}{8}n\ (n+1)$

(C) $\frac{1}{6}n\ (2n+1)$

(D) $\frac{1}{6}(n+1)\ (2n+1)$

Q.89 If the mean of first n natural numbers is equal to $\frac{n+7}{3}$, then n is equal to -

(A) 10 (B) 11

(C) 12 (D) None of these

Q.90 If the mean of numbers 27, 31, 89, 107, 156 is 82, then the mean of 130, 126, 68, 50, 1 is-

(A) 75 (B) 157

(C) 82 (D) 80

Q.91 The mean of first three terms is 14 and mean of next two terms is 18. The mean of all the five terms is -

(A) 14.5 (B) 15.0

(C) 15.2 (D) 15.6

Q.92 In an arranged series of n observations (n being an odd number), the median is the value of -

(A) $\left(\frac{n}{2}\right)$th item (B) $\left(\frac{n+1}{2}\right)$th item

(C) $\left(\frac{n}{2}+1\right)$th item (D) $\left(n+\frac{1}{2}\right)$th item

Q.93 The median of 10, 14, 11, 9, 8, 12, 6 is

(A) 10 (B) 12

(C) 14 (D) 11

Q.94 If a variable takes the discrete values $\alpha + 4$, $\alpha - \frac{7}{2}$, $\alpha - \frac{5}{2}$, $\alpha - 3$, $\alpha - 2$, $\alpha + \frac{1}{2}$, $\alpha - \frac{1}{2}$, $\therefore \alpha + 5$ ($\alpha > 0$), then the median is-

(A) $\alpha - \frac{5}{4}$ (B) $\alpha - \frac{1}{2}$

(C) $\alpha - 2$ (D) $\alpha + \frac{5}{4}$

Q.95 In an arranged discrete series in which total number of observations 'n' is even, median is

(A) $\frac{n}{2}$th item

(B) $\left(\frac{n}{2}+1\right)$th item

(C) the mean of $\frac{n}{2}$th and $\left(\frac{n}{2}+1\right)$th item

(D) None of these

Q.96 The mode of the following items is 0, 1, 6, 7, 2, 3, 7, 6, 6, 2, 6, 0, 5, 6, 0 is -

(A) 0 (B) 5

(C) 6 (D) 2

Q.97 If the mode of a data is 18 and the mean is 24, then median is -

(A) 18 (B) 24

(C) 22 (D) 21

Q.98 If the mean of the first n odd natural numbers be n itself, then n is -

(A) 1 (B) 2

(C) 3 (D) any natural number

Q.99 Mean of the first n terms of the A.P. a + (a + d) + (a + 2d) + ... is -

(A) a + $\frac{nd}{2}$ (B) a + $\frac{(n-1)d}{2}$

(C) a + (n – 1) d (D) a + nd

Q.100 If the mean of n observations $1^2, 2^2, 3^2, \ldots, n^2$ is $\frac{46n}{11}$, then n is equal to -

(A) 11 (B) 12

(C) 23 (D) 22

Q.101 The mean of 50 observations is 36. If two observations 30 and 42 are deleted, then the mean of the remaining observations is-

(A) 48 (B) 36

(C) 38 (D) None of these

Q.102 A group of 10 items has mean 6. If the mean of 4 of these items is 7.5, then the mean of the remaining items is -

(A) 6.5 (B) 5.5

(C) 4.5 (D) 5.0

Q.103 The mean of a set of observations is $\bar{x}$. If each observation is divided by $\alpha, \alpha \neq 0$, and then is increased by 10 then the mean of the new set is -

(A) $\frac{\bar{x}}{\alpha}$ (B) $\frac{\bar{x}+10}{\alpha}$

(C) $\frac{\bar{x}+10\alpha}{\alpha}$ (D) $a\bar{x} + 10$

Q.104 Ram spends equal amounts on purchasing three kinds of pens being sold at Rs.5, Rs.10, Rs.15 per piece. Average cost of each pen is -

(A) Rs.10 (B) Rs. $\frac{90}{11}$

(C) Rs.9 (D) None of these

Q.105 If a, b, c are any three positive numbers, then the least value of (a + b + c) $\left(\frac{1}{a}+\frac{1}{b}+\frac{1}{c}\right)$ is -

(A) 3 (B) 6

(C) 9 (D) None of these

Q.106 The median of the data 13, 14, 16, 18, 20, 22 is-

(A) 17 (B) 16

(C) 18 (D) None of these

Q.107 If mean = (3 median – mode) x, then the value of x is -

(A) 1 (B) 2

(C) 1/2 (D) 3/2

ANSWER KEY

1.	A	**2.**	C	**3.**	C	**4.**	A
5.	D	**6.**	C	**7.**	B	**8.**	D
9.	C	**10.**	B	**11.**	A	**12.**	B
13.	C	**14.**	A	**15.**	B	**16.**	B
17.	D	**18.**	B	**19.**	D	**20.**	D
21.	C	**22.**	D	**23.**	B	**24.**	B
25.	D	**26.**	D	**27.**	B	**28.**	B
29.	B	**30.**	B	**31.**	A	**32.**	C
33.	C	**34.**	A	**35.**	C	**36.**	C
37.	B	**38.**	D	**39.**	B	**40.**	B
41.	C	**42.**	C	**43.**	B	**44.**	C
45.	B	**46.**	B	**47.**	D	**48.**	C
49.	B	**50.**	C	**51.**	C	**52.**	C
53.	B	**54.**	C	**55.**	B	**56.**	C
57.	D	**58.**	B	**59.**	A	**60.**	C
61.	A	**62.**	D	**63.**	B	**64.**	D
65.	B	**66.**	C	**67.**	C	**68.**	B
69.	D	**70.**	B	**71.**	D	**72.**	B
73.	D	**74.**	C	**75.**	D	**76.**	A
77.	D	**78.**	A	**79.**	A	**80.**	C
81.	B	**82.**	A	**83.**	C	**84.**	C
85.	B	**86.**	C	**87.**	C	**88.**	D
89.	B	**90.**	A	**91.**	D	**92.**	B
93.	A	**94.**	A	**95.**	C	**96.**	C
97.	C	**98.**	D	**99.**	B	**100.**	A
101.	B	**102.**	D	**103.**	C	**104.**	B
105.	C	**106.**	A	**107.**	C		

PROBABILITY

DEFINITIONS

I. Trial and Event :

An experiment is called a **trial** if it results in anyone of the possible outcomes and all the possible outcomes are called **events**.

For Example

(i) Participation of player in the game to win a game, is a trial but winning or losing is an event.

(ii) Tossing of a fair coin is a trial and turning up head or tail are events.

(iii) Throwing of a dice is a trial and occurrence of number 1 or 2 or 3 or 4 or 5 or 6 are events.

(iv) Drawing a card from a pack of playing cards is a trial and getting an ace or a queen is an event.

II. Exhaustive Events :

Total possible outcomes of an experiment are called its **exhaustive events**.

For Example

(i) Tossing a coin has 2 exhaustive cases i.e. either head or tail may come upward.

(ii) Throwing of a die has 6 exhaustive cases because any one of six digits 1, 2, 3, 4, 5, 6 may come upward.

(iii) Throwing of a pair of dice has 36 exhaustive cases because any one of six digits 1, 2, 3, 4, 5, 6 may come upward on any dice so total number of exhaustive cases = 6 x 6 = 36.

(iv) Tossing of two and three coins results in 4 and 8 exhaustive cases respectively because head or tail may come upward on any coin. So in case of two coins total number of cases = 2 x 2 = 4 and in case of three coins total number of cases = 2 x 2 x 2 = 8

III. Favourable Events :

Those outcomes of a trial in which a given event may happen, are called **favourable cases** for that event.

For Example -

(i) If a coin is tossed then favourable cases of getting H is 1.

(ii) If a dice is thrown then favourable case for getting 1 or 2 or 3 or 4 or 5 or 6, is 1.

(iii) If two dice are thrown, then favourable cases of getting a sum of numbers as 9 are four i.e (4,5), (5,4), (3,6), (6,3).

IV. Equally likely events :

Two or more events are said to be **equally likely events** if they have same number of favourable cases.

For Example

(i) The result of drawing a card from a well shuffled pack of cards, any card may appear in a draw, so 52 different cases are equally likely.

(ii) In tossing of a coin, getting of 'H' or 'T' are two equally likely events.

(iii) In throwing of a dice, getting 1 or 2 or 3 or 4 or 5 or 6 are six equally likely events.

V. Mutually Exclusive or Disjoint Events :

Two or more events are said to be **mutually exclusive**, if the occurrence of one prevents or precludes the occurrence of the others. In other words they cannot occur together.

For example,

(i) In tossing of a coin, getting of 'H' or 'T' are two mutually exclusive events because they can not happen together.

(ii) In throwing of a dice, getting 1 or 2 or 3 or 4 or 5 or 6 are six mutually exclusive events.

(iii) In drawing a card from a pack of cards, getting a card of diamond or heart or club or spade are four mutually exclusive events.

VI. Simple and Compound Events :

If in any experiment only one event can happen at a time then it is called a **simple event**. If two or more events happen together then they constitute a **compound event.**

For Example,

If we draw a card from a well shuffled pack of cards, then getting a queen of spade is a simple event and if two coins A and B are tossed together then getting 'H' from A and 'T' from B is a compound event.

VII. Independent and Dependent Events :

Two or more events are said to be **independent** if happening of one does not affect other events. On the other hand if happening of one event affects (partially or totally) other event, then they are said to be **dependent events.**

For Example,

(i) If we toss two coins, then the occurrence of head on one coin does not influence the occurrence of head or tail on the other coin in any way. Hence these events are independent.

(ii) Suppose a bag contains 5 white and 4 black balls. Two balls are drawn one by one. Then two events that first ball is white and second ball is black are independent if the first ball is replaced before drawing the second ball. If the first ball is not replaced then these two events will be dependent because second draw will have only 8 exhaustive cases.

VIII. Sample Space :

The set of all possible outcomes of a trial is called its **sample space**. It is generally denoted by S and each outcome of the trial is said to be a point of sample of S.

For example

(i) If a dice is thrown once, then its sample space

$S = \{1, 2, 3, 4, 5, 6\}$

(ii) If two coins are tossed together then its sample space

$S = \{HT, TH, HH, TT\}$.

Mathematical Definition of Probability

Let there are n exhaustive, mutually exclusive and equally likely cases for an event A and m of those are favourable to it, then probability of happening of the event A is defined by the ratio m/n which is denoted by P(A). Thus

$$P(A) = \frac{m}{n} = \frac{\text{No.of favourable cases to A}}{\text{No.of exhaustive cases to A}}$$

Note : It is obvious that $0 \leq m \leq n$. If an event A is certain to happen, then m = n thus P(A) =1. If A is impossible to happen then m = 0 and so P(A) = 0. Hence we conclude that

$$0 \leq P(A) \leq 1$$

Further, if $\overline{A}$ denotes negative of A i.e. event that A doesn't happen, then for above cases m, n; we shall have

$$P(\overline{A}) = \frac{n-m}{n} = 1 - \frac{m}{n} = 1 - P(A)$$

$$\therefore \quad P(A) + P(\overline{A}) = 1$$

Playing Cards :

(i) Total : 52 (26 red, 26 black)

(ii) Four suits : Heart, Diamond, Spade, Club - 13 cards each

(iii) Court Cards : 12 (4 Kings, 4 queens, 4 jacks)

(iv) Honour Cards : 16 (4 aces, 4 kings, 4 queens, 4 jacks)

SUMMARY OF THE CHAPTER

1. INTRODUCTION

Let us go through the following conversation between two student who are standing at a bus stop and waiting for school bus to come-

Ramesh : I doubt that bus will come now.

Sarika : Probable we reached late.

Ramesh : Most probably Maths teacher will start a new topic today.

Sarika : There is only 50-50 chance of teacher starting a new topic because its an activity day today.

We observe here the words like- doubt, probably, most probably, chance. All these words show the uncertainty in happening or non-happening of an event.

Mathematically, we can measure the level of uncertainty. This is studied under the head called probability under the topic 'Probability'.

The concept of probability originated with gambling, when a gambler Chevalier de Mere asked a French Mathematician Blaise Pascal to solve certain dice problems. Pascal, with his Mathematician friend Pierre de Fermat, discussed this problem. Both of them worked on it and solved to problem seperately and got the same result. This work of Pascal and fermat showed a path to a new branch of mathematics called "Probability theory" which was later developed by other mathematicians like Bernoulllie, Laplace, Markov and Kolmogorov.

Though probability started with gambling, now a days it is used extensively in the fields of physical sciences, commerce, biological sciences, medical sciences, weather forecasting and in many more field.

In the present chapter, we will study Probability as an analysis of results of different experiments.

2. TERM RELATED TO PROBABILITY

Before coming to probability, let us define the following terms related to probability.

Experiment. It is an operation which can produce some well defined outcomes for example- 'tossing a coin' with its outcomes as Head or Tail, ' throwing a die' with its outcomes as coming up of numbers 1, 2, 3, 4, 5 or 6' drawing a card from a deck' with its outcomes as getting any one card out of 52 cards etc.

Random experiment. When an experiment is performed without any biasing or without any prior knowledge of the exact or precise outcome is called a random experiment. For example- in tossing acoin, one is not sure of getting Head or Tail. So it is a random experiment.

Trial. When an experiment is performed repeatedly, then each performance is called a trial. Each trial results in one or severall outcomes for example, if a coin is tossed 5 times then each tossing is called a trial and each trial results in either Head or Tail.

Event. For a particular experiment, a collection of some or all outcomes is called an event. for example, if we throw a die, the possible outcomes are 1, 2, 3, 4, 5 or 6. Then getting an even number is an event which is favoured by coming up of an even number 2, 4 or 6. Similarly getting a prime number is another event of the same experiment which is favoured by coming up of a prime number 2, 3 or 5. An event is said to be elementary if it is an outcome of a trial. For example, in tossing a coin getting of a head and getting a tail are two elementary events.

In general an event is denoted by E. we say that event has happened if outcome of the trial is one of the favourable outcomes, otherwise it is said that event has not happened.

3. EXPERIMENTAL (OR EMPIRICAL) PROBABILITY

Let n be the total number of trials performed out of which m times an event E is happening. Then we define

Empirical probability of event

$$E = \frac{\text{No.of trials in which the event has happen}}{\text{Total number of trials}}$$

$$\text{i.e.,} \quad P(E) = \frac{m}{n}$$

For example, if a coin is tossed 50 times out of which 22 times head is coming up and 28 times tail is coming up, then the probability of getting head $= \frac{22}{50}$ and the probatility of getting tail $= \frac{28}{50}$.

Some properties of probability of an event.

1. An event which is sure to happen is called 'sure event' or 'certain event'. In this case, the number of trials in which an event can happen is same as the total number of trials.

$\therefore$ Probability of 'sure event' = 1.

2. An event which cannot happen at all is called an 'impossible event'. In this case, the number of trials in which an event can happen is zero.

$\therefore$ Probability of an impossible event = 0.

3. Since number of trials in which an event E can happen is greater than or equal to zero but less than or equal to the total number of trials.

$$\therefore \quad 0 \le = \frac{\text{No. of trials in which an event can happen}}{\text{total number of trials}} \le 1$$

$$\Rightarrow \quad 0 \le P(E) \le 1.$$

4. If E_1, E_2 E_3, ..., E_n are the events which cover the total outcomes and are elementary events, then $P(E_1) + P(E_2) + P(E_3) + ... P(E_n) = 1$.

1. Three coins are tossed simultaneously 200 times with the following frequencies of diferent outcomes

Outcome	3heads	2heads	1heads	No head
Frequency	23	72	77	28

If the three coins are simultaneously tossed again, compute the probability of 2 heads coming up.

2. An organisation selected 2400 families at random and surveyed them to determine a relationship between income level and the number of vehicles in a family. The information gathered is listed in the table below :

Monthly income (in Rs.)	*Vehicles per family*			
	0	1	2	above 2
Less than 7000	10	160	25	0
7000 – 10000	0	305	27	2
10000 – 13000	1	535	29	1
13000 – 16000	2	469	59	25
16000 or more	1	579	82	88

Suppose a family is chosen. Find the probability that the family chosen is
(a) earning Rs. 10000 - 13000 per month and owning exactly 2 vehicles.
(b) earningRs. 16000 or more per month and owning exactly 1 vehicle.
(c) earning less than Rs. 7000 per month and does not own any vehicle.
(d) earning Rs. 13000 - 16000 per month and owning more than 2 vehicles.
(e) owning not more than 1 vehicle.

3. To know the opinion of the students about the subject statistics, a survey of 200 students was conducted. The data is recorded in the following table.

Opinion	*Number of students*
like	135
dislike	65

Find the probability that a student chosen at random
(a) likes statistics, (b) does not like it.

4. The given table shows the month of birth of 40 students of class IX of a particular section of a school.

Month of birth	*Number of students born*
January	3
February	4
March	2
April	2
May	5
June	1
July	2
August	6
September	3
October	4
November	4
December	4
Total	**40**

With the help of above table find the probability that a student of the class was born in August.

5. Two coins are tossed simultaneously 100 times and we get the following outcomes :
(a) No head = 30 (b) One head = 20 (c) Two heads = 50
Find the probability of each event.

6. Two coins tossed simultaneously, find the probability of getting one or more tail.

7. A die is thrown .Find the probability of getting an odd number.

8. A coin is tossed 15 times and observed that 11 times head comes up. Find the probability that a tail comes up.

9. The marks obtained by the sudents of two sections of a school in english are given in the following table.

Marks	***Number of students***
0 – 20	8
20 – 40	12
40 – 60	30
60 – 80	30
80 – 100	10
Total	**90**

(a) Find the probability that a student obtained less than 40 in english test.
(b) Find the probability that a student obtained marks 80 or above.

10. A die is thrown 42 times and the outcomes listed in the form of a table as follows :

Number of times these scores turn up	1	2	3	4	5	6
Number of times a die is thrown	5	2	7	14	10	4

Find the probability that 5 turn up.

11. Without looking at the page the pencil is placed on one of these number i.e., the number is chosen at random. What is the probability that digit in its unit place is 5?

Digit	0	1	2	3	4	5	6	7	8	9
f	24	9	17	29	45	60	70	78	83	85

12. The record of a weather station shows that out of the past 150 consecutive days its weather forecasts were correct 90 times.
(a) What is the probability that on a given day it was correct ?
(b) What is the probability that it was not correct on a given day ?

13. Two coins are tossed simultaneously by 300 times and we get. Two heads : 135 ; One head : 63; No head : 102 Find the probability of occurrence of each of these events.

14. A die is thrown 500 times with the frequencies for the outcomes 1, 2, 3, 4, 5, 6, as given in the following table.

Outcomes	1	2	3	4	5	6
Frequencies	80	75	90	75	85	95

Find the probability of getting an outcome less than 4.

15. Three coins are tossed simultaneously 200 times with the following frequencies of different outcomes

Outcomes	3 Heads	2 Heads	1 Head	No Head
Frequency	23	72	77	28

If the three coins are simultaneously tossed again, compute the probability of coming up
(a) 2 heads (b) no tail.

SOLVED PROBLEMS

Ex.1 A die is thrown 1000 times with the frequencies for the outcomes 1, 2, 3, 4, 5 and 6 as given in the following table :

Outcome	1	2	3	4	5	6
Frequency	179	150	157	149	175	190

Find the probability of getting each outcome.

Sol. Total number of trials = 1000

Let E_i = event of getting outcome i, where i = 1, 2, 3, 4 5 or 6.

Then probability of getting outcome 1

$$\Rightarrow \quad P(E_1) = \frac{\text{No. of times 1 comes up}}{\text{total no. of trials}}$$

$$\Rightarrow \quad P(E_1) = \frac{179}{1000} = 0.179.$$

Probability of getting outcome 2

$$\Rightarrow \quad P(E_2) - \frac{\text{No. of times 2 comes up}}{\text{Tatal no. of trials}}$$

$$\Rightarrow \quad P(E_2) = \frac{150}{1000} = 0.150$$

Similarly, $P(E_3) = \frac{157}{1000} = 0.157$ $\qquad P(E_4) = \frac{149}{1000} = 0.149$

$P(E_5) - \frac{175}{1000} = 0.175$ $\qquad P(E_6) - \frac{190}{1000} = 0.190$

Ex.2 Eleven bags of wheat flour, each marked 5 kg, actually contained the following weights of flour (in kg) 4.97, 5.05, 5.08, 5.03, 5.00, 5.06, 5.08, 4.98, 5.04, 5.07, 5.00. Find the probability that any of these bags chosen at random contains more than 5kg of flour.

Ans. Total number of bags checked = 11

No. of bags that contain more than 5 kg of flour = 7

∴ Probability of a bag containing more than 5 kg. of flour

$$= \frac{\text{No. of bags that contain more than 5 kg of flour}}{\text{Tatal number of bags checked}} = \frac{7}{11} = 0.636.$$

Ex.3 Following is the frequency table showing number of students having different blood groups of a particular class.

A	B	O	AB
9	13	18	20

Find the probability that any of these boys chosen at random has blood group O.

Sol. Total number of student in the class

$$= 9 + 13 + 18 + 20 = 60$$

Number of students having blood group O = 18

∴ Probability of a randomly selected student having blood group O = $\frac{18}{60} = 0.3.$

Ex.4 A tyre manufacturing company kept a record of the distance covered before a tyre needed to be replaced. The table shows the results of 1000 cases.

Distance (in km)	Less than 4000	4000 to 9000	9001 to 14000	More than 14000
Frequency	20	210	325	445

If you buy a tyre of this company what is the probability that :

(i) it will need to be replaced before it has covered 4000 km?

(ii) it will last more than 9000 km?

(iii) it will need to be replaced After it has covered some where between 4000 km and 14000 km?

Sol. The total number of cases = 1000.

(i) Number of tyres needed to be replaced before it covers 4000 km = 20.

$\therefore$ Probability of a tyre to be replaced before it covers 4000 km = $\frac{20}{1000} = 0.02$

(ii) Number of tyres needed to be replaced when it has coverd a distance more than

9000 km = 325 + 445 = 770.

$\therefore$ Probability that a tyre will last more than

9000 km = $\frac{770}{1000} = 0.77$

(iii) Number of tyres needed to be replaced when it has covered a distance between 4000 km and 14000km

= 210 + 325 = 535

$\therefore$ Probability of a tyre needed to be replaced between 4000 km and 14000 km

= $\frac{535}{1000} = 0.535$

Ex.5 An organization selected 2400 families at random and surveyed them to determine a relationship between income level and the number of vehicles in a family. The information gathered is listed in the table below :

Monthly income (in Rs.)	Vehicles per family			
	0	1	2	Above 2
Less than 7000	10	160	25	0
7000-10000	0	305	27	2
10000-13000	1	535	29	1
13000-16000	2	469	59	25
16000 or above	1	579	82	88

Suppose a family is chosen . Find he probability that the family chosen is :

(i) earning Rs. 10000 -13000 per month and owning exactly 2 vehicles.

(ii) earning Rs. 16000 or more per month and owning exactly 1 vehicles.

(iii) earning less than Rs. 7000 per month and does not own any vehicle.

(iv) earning Rs. 13000-16000 per month and owning more than 2 vehicles.

(v) owning not more than 1 vehicle.

Sol. Total number of families surveyed = 2400.

(i) From table, we observe that

No. of families earning Rs. 10000 – 13000 per month and owning exactly 2 vehicles = 29.

∴ Probability of family earning

Rs. 10000 – 13000

per month and owning exactly 2 vehicles

$$= \frac{29}{2400}$$

(ii) No. of families earning Rs. 16000 or more per month and owning exactly 1 vehicle = 579

∴ Probability of family earning Rs. 16000 or more per month and owning exactly 1 vehicle

$$= \frac{579}{2400} = \frac{193}{800}$$

(iii) Number of families earning less than

Rs. 7000 per month and does not own any vehicle = 10.

∴ Probability of a family earning less than Rs. 7000 per month and does not own any vehicle

$$= \frac{10}{2400} = \frac{1}{240}$$

(iv) Number of families earning Rs. 13000-16000 per month and owning more than 2 vehicles = 25.

∴ Probability of a family earning Rs. 13000–16000 per month and owning more than 2 vehicles

$$= \frac{25}{2400} = \frac{1}{96}$$

(v) Number of families owning not more than 1 vehicle

= Number of families ownig either one or no vehicle

= (10 + 0 + 1 + 2 + 1) + (160 + 305 + 535 + 469 + 579) = 14 + 2048 = 2062

∴ Probability of a family owning not more than

1 vehicle $= \frac{2062}{2400} = \frac{1031}{1200}$.

Ex.6 An insurance company selected 2000 drivers at random in a particular city to find a relationship between age and accidents. The data obtained are given in the following table :

Age of drivers (in years)	Accidents in one year				
	0	1	2	3	Over 3
18-29	440	160	110	61	35
30-50	505	125	60	22	18
Above 50	360	45	35	15	9

Find the probabilities of the following events for a driver chosen at random from the city :

(i) being 18-29 years of age and having exactly 3 accidents in one year.

(ii) being 30-50 years of a age and having one or more accident in a year.

(iii) having no accidents in one year.

Sol. Total number of drivers surveyed = 2000.

(i) The number of drivers of age 18-29 years age and having exactly 3 accidents in a year = 61.

$\therefore$ Probability of a driver of age 18-29 years with exactly 3 accidents = $\frac{61}{2000}$

(ii) The number of drivers of age 30-50 years and having one or more accidents in a year
= 125 + 60 + 22 + 18 = 225.

$\therefore$ Probability of a driver of age 30-50 years with one or more accidents = $\frac{225}{2000} = \frac{9}{80}$

(iii) The number of drivers having no accidents in one year = 440 + 505 + 360 = 1305.

$\therefore$ Probability of a driver with no accident = $\frac{1305}{2000} = \frac{261}{400}$

Ex.7 100 surnames were randomly picked up from a local telephone directory and a frequency distribution of the number of letter in the English alphabet in the surnames was found as follows :

Number of letters	Number of surnames
1-3	6
4-5	30
6-7	44
8-11	16
12-20	4

A surname is picked up randomly from the directory, find the probability that
(i) it contains less than 6 letters
(ii) it contain 4 to 12 letters
(iii) it contains more than or equal to 8 but less than or equal to 20 letters.

Sol. Total surnames checked = 100

(i) Number of surnames containing less than 6 letters = 6 + 30 = 36.

$\therefore$ P (surname contains less than 6 letters) = $\frac{36}{100} = \frac{9}{25}$.

(ii) Number of surnames containing 4 to 12 letters = 30 + 44 + 16 = 90

$\therefore$ P (surname contains 4 to 12 letters) = $\frac{90}{100} = \frac{9}{10}$

(iii) Number of surnames containing 8 to 20 letters = 16 + 4 = 20.

$\therefore$ P (surname contains 8 to 20 letters) = $\frac{20}{100} = \frac{1}{5}$

Ex.8 The frequency table for the distance (in km) of 40 engineers from their residence to their place of work was found as ahead.

Distance (in km)	No. of Engineers
0-5	5
5-10	11
10-15	10
15-20	9
20-25	1
25-30	2
30-35	2

If an engineer is selected at random, what is the probability that he lives at a distance of
(i) less than 10 km from his place of work.
(ii) more than or equal to 20 km from his place of work.
(iii) more than 35 km from his place of work.
(iv) not more than 35 km from his place of work.
Also mention types of events in case (iii) and (iv).

Sol. The total number of engineers surveyed = 40.

(i) Number of engineers who live within 10 km from his place of work = 5 + 11 = 16.

$\therefore$ P (engineer lives within 10 km from his place of work) = $\frac{16}{40} = \frac{2}{5}$

(ii) Number of engineers who live at a distance or more than or equal to 20 km from his place of work = 1 + 2 + 2 = 5

$\therefore$ P (engineers lives at a distance of more than or equal to 20 km) = $\frac{5}{40} = \frac{1}{8}$

(iii) Number of engineers who live at a distance more than 35 km from his place of work = 0 (as no on lived beyond 35 km).

$\therefore$ P (engineer lived beyond 35 km) = $\frac{0}{40} = 0$

$\therefore$ This is an impossible event.

(iv) Number of engineers who live within 35 km from their place of work = 5 + 11 + 10 + 9 + 1+ 2 + 2 = 40.

$\therefore$ P (engineer lived within 35 km) = $\frac{40}{40} = 1$

$\therefore$ This is a 'certain' or a 'sure' event.

Ex.9 Consider the following frequency table which gives the weights of 38 students of a class-

Weight (in km)	No. of students
31-35	9
36-40	5
41-45	14
46-50	3
51-55	1
56-60	2
61-65	2
66-70	1
71-75	1

(i) Find the probability that the weight of a student in the class lies in the interval 46-50 kg.

(ii) Give two events in this context, one having probability 0 and the other having probability 1.

Sol. The total number of students = 38.

(i) Number of students weighting 46 to 50 kg = 3

$\therefore$ P (student weight 46 to 50 kg) = $\frac{3}{38}$

(ii) Let us consider the event E = Student weight 30 kg. Then as there is no student in the class who weight 30 kg.

$\therefore$ P(E) = $\frac{0}{38} = 0$

Again consider the event F $\equiv$ Student weighs more than 30 kg.

Then as all students in the class weigh more than 30 kg $\therefore$ P(F) = $\frac{38}{38} = 1$.

Ex.10 Fifty seeds were selected at random from each of 5 bags of seeds and were kept under standardized conditions favourable for germination. After 20 days, the number of seeds which had germinated in each collection were counted and recorded as follows :

Bag	1	2	3	4	5
No. of seeds germinated	40	48	42	39	41

What is the probability of germination of

(i) more than 40 seeds in a bag?

(ii) 49 seeds in a bag?

(iii) more than 35 seeds in a bag?

Sol. Total number of bags observed= 5.

(i) Number of bags in which germination of more than 40 seeds in there = 3 (by number 2,3 and 5).

$\therefore$ P (germination of 40 seeds in a bag) = $\frac{3}{5} = 0.6$.

(ii) number of bags in which 49 seeds germinated = 0.

$\therefore$ P (germination of 49 seeds in a bag) = $\frac{0}{5} = 0$.

(iii) Number of bags in which more than 35 seeds germinated = 5 (in all bags germination was more than 35 seeds).

$\therefore$ P (germination of more than 35 seeds in a bag) = $\frac{5}{5} = 1$

Ex.11 A coin is tossed 150 times and the outcomes are recorded. The frequency distribution of the outcomes H (i.e., head) and T (i.e., tail) is given below :

Outcome	H	T
Frequency	85	65

Find the value of P (H), i.e., probability of getting a head in a single trial.

Sol. Total number of trials = 150

Chances or trials which favour the outcome H = 85.

P (H) = $\frac{85}{150}$ = 0.567 (approx)

Ex.12 A die is tossed 120 times and the outcomes are recorded as below:

Outcome	**1**	**Even Number less than 6**	**Odd number greater than 1**	**6**
Frequency	**20**	**35**	**30**	**15**

Find the probability in a trial of getting

(i) The number 1

(ii) The number 6

(iii) The even number less than 6.

(iv) The odd number greater than 1.

Sol. Total number of trials = 120

(i) Chances which favour the outcome 1 are 20.

So, P (getting 1) = $\frac{20}{120}$ = 0·167 (approx)

(ii) P (getting 6) = $\frac{15}{120}$ = 0.125

(iii) Now, getting an even number less than 6 implies that the outcomes 2 or 4.

The total number of chances of getting 2 or 4, i.e., an even number less than 6 = 35

P (even number less than 6) = $\frac{35}{120} = \frac{7}{24}$ = 0·292 (approx)

(iv) Getting an odd number greater than 1, i.e., 3 or 5.

The chances favouring an odd number greater than 1 = 30.

So, P (an odd number greater than 1) = $\frac{30}{120} = \frac{1}{4}$ = 0·25

Ex.13 Two similar coins were tossed simultaneously 1000 times and the frequency distribution of heads obtained on each toss is as below :

No. of heads	0	1	2
Frequency	200	500	300

Find the probabilities of the following :

(i) Probability of getting one head.

(ii) Probability of getting two heads.

(iii) Probability of getting at least one head

(iv) Probability of getting less than two heads.

(v) Probability of getting three heads.

(vi) Probability of getting not more than two heads.

Sol. Total number of trials = 1000

(i) Total number of chances favouring the event of getting one head = 500. So, P (one head) = $\frac{500}{1000}$ = 0·5

(ii) P (two heads) = $\frac{300}{1000}$ = 0·3

(iii) P (at least one head) = P (1 head or 2 heads) = $\frac{500+300}{1000}$ = 0.8

(iv) P (less than two heads) = P (0 head or 1 head) = $\frac{200+500}{1000}$ = 0·7

(v) P (three heads) = $\frac{0}{1000}$ (No chance favour the occurence of three heads) = 0

(vi) P(not more than two heads) = $\frac{200+500+300}{1000}$ =1. (∵ all chances are favourable)

Ex.14 There are 500 packets in a large box and each pocket contains 4 electric devices in it. On testing, at the time of packing, it was noted that there are some faulty pieces in the packets. The data is as below :

No. of faulty devices in a packet	0	1	2	3	4	Total number of packets
Number of packets	300	100	50	30	20	500

If one packet is drawn from the box, what is the probability that all the four devices in the packet are without any fault?

Sol. When the packet has all the four devices without fault, it means the number of faulty devices in the packet is 0. Number of chances which are favourable to 0 are 300 as given in the table above.

Thus, the probability of packet containing all the four devices without any fault

$$= \frac{300}{500} = \frac{3}{5} = 0.6$$

Ex.15 A factory manufacturing car batteries made a survey in the field about the life of these batteries. The data obtained is as under :

Life time (in months)	Less than 24	24 to 36	36 to 48	more than 48	Total number of batteries
Frequency or the number of batteries	40	220	540	200	1000

If you put a battery of this company in your car, what is the probability that (i) the battery will last for more than 36 months? (ii) the battery will last for less than 48 months? (iii) the battery will last for 36 to 48 months?

Sol. Total frequency or the total number of trials made = 1000

(i) The total number of batteries which last for more than 36 months = 540 + 200 = 740

Now, P (battery will last for more than 36 months) = $\frac{740}{1000}$ = 0·74

(ii) The total number of batteries which last for less than 48 months = 40 + 220 + 540 = 800

So, P (battery will last for less than 48 months) = $\frac{800}{1000}$ = 0.80

(iii) The total number of batteries which last for 36 to 48 months = 540

So, P (battery will last for 36 to 48 months) = $\frac{540}{1000}$ = 0·54

Ex.16 400 students of class X of a school appeared in a test of 100 marks in the subject of social studies and the data about the marks secured is as below :

Marks secured	0-25	26-50	51-75	Above 75	Total number of students
Number of Students	50	220	100	30	400

If the result card of a student he picked up at random, what is the probability that the student has secured more than 50 marks.

Sol. Total number of students, i.e . the total frequency = 400

The total number of students who secured more than 50 marks = 100 + 30 = 130

Probability that the marks secured are more than 50 = $\frac{130}{400} = \frac{1.3}{4}$ = 0.325

Ex.17 100 plants each, were planted in 100 schools during Van Mahotsava. After one month, the number of plants that survived were recorded as in data below :

Number of plants survived	Less than 25	26-50	51-60	61-70	More Than 70	Total number of Schools
Number of Schools = frequency	15	20	30	30	5	100

When a school is selected at random for inspection, what is the probability that:

(i) More than 25 plants survived in the school?

(ii) Less than 61 plants survived in the school?

(iii) 61 to 70 plants survived in the school?

Sol. Total frequency or the total number of schools in which plants were planted = 100

(i) Number of schools in which more than 25 plants survived = 20 + 30 + 30 + 5 = 85

P (more than 25 plants survived in the school) = $\frac{85}{100}$ = 0.85

(ii) Number of schools in which less than 61 plants survived = 15 + 20 + 30 = 65

P (Less than 61 plants survived) = $\frac{65}{100}$ = 0·65

(iii) P (61 to 70 plants survived) = $\frac{30}{100}$ = 0·30

Ex.18 An insurance company selected 2000 drivers at random (i.e., without any preference of one driver over another) in a particular city to find a relationship between age and accidents. The data obtained are given in the following table :

Age group of drivers (in years)	Number of accidents in one year				
	0	1	2	3	More than 3
18-29	440	160	110	61	35
30-50	505	125	60	22	18
Above 50	360	45	35	15	9

Find the probability of the following events for a driver selected at random from the city:

(i) being 18-29 years of age and having exactly 3 accidents in one year.

(ii) being 30-50 years of age and having one or more accidents in a year.

(iii) having no accident in one year.

Sol. (i) The number of drivers in the age group 18-29 having exactly 3 accidents = 61

Total number of trials = 2000

So, P (driver in age group 18-29 having exactly 3 accidents in one year) = $\frac{61}{2000}$ = 0.0305

(ii) The number of drivers in the age group 30-50 and having one or more than one accident in one year = 125 + 60 + 22 + 18 = 225

P (driver in age group 30-50 having one or more accidents in one year) = $\frac{225}{2000}$ = 0·1125

(iii) The number of drivers having no accident in one year = 440 + 505 + 360 = 1305

So, P (driver having no accident) = $\frac{1305}{2000}$ = 0·6525

EXERCISE – I UNSOLVED QUESTIONS

Q.1 **Fill in the blanks.**

(i) Probability originated with.....

(ii) ....is the collection of some outcomes of the experiment.

(iii) Probability of any event always lies between.... and ..... .

(iv) Probability of a sure event is always ..... .

(v) Zero is the probability of an ..... event.

Q.2 A die is thrown 100 times and outcomes are noted as follows.

even number 38 times

odd number 62 times

If the die is thrown again, what is the probability of getting an

(i) even number, (ii) odd number

Q.3 1500 families with 2 children were selected randomly, and the following data were recorded. **[NCERT]**

No. of girls in a family	2	1	0
No. of families	475	814	211

Compute the probability of a family, chosen at random, having

(i) 2 girls, (ii) 1 girl, (iii) No girl

Also check whether the sum of these probabilities is 1.

Q.4 The percentage of marks obtained by a student in the monthly unit test are given below :

Unit test	I	II	III	IV	V
% of marks obtained	69	71	73	68	74

Based on this data, find the probability that the student gets :

(i) more that 70% marks in a unit test

(ii) more that 80% marks in a unit test

(iii) 60 – 70% marks in a unit test.

Q.5 Three coins are tossed simultaneously 200 times with the following frequencies of different outcomes **[NCERT]**

Outcome	3 Heads	2 Heads	1 Head	No Head
Frequency	23	72	77	28

If the three coins are simultaneously tossed again, compute the probability of :

(i) 2 heads coming up

(ii) at least 2 heads coming up

(iii) at most 2 heads coming up

Q.6 On one page of a telephone directory, there were 200 telephone numbers. The frequency distribution of their unit place digit is given in the following table.

Digit	0	1	2	3	4	5	6	7	8	9
Frequency	22	26	22	22	20	10	14	28	16	20

Without looking at the page, the pencil is palced on one of these number i.e., the number is chosen at random. What is the probability that :

(i) the digit in its unit place is 6 ?

(ii) the digit in its unit place is even ?

(iii) the digit in its unit place is odd ?

(iv) the digit in its unit place is more than 5 ?

(v) the digit in its unit place lies between 2 and 7 (excluding 2 and 7).

Q.7 The performance of 90 students of three sections of a class in Mathematics test of 100 marks is listed as follows :

Marks obtained	0-20	20-30	30-40	40-50	50-60	60-70
No. of students	7	10	10	20	20	15
Marks obtained	70 above					
No. of students	8					

A student of that class is selected at random. What is the probability that he scored

(i) less than 20 marks

(ii) more than 70 marks

(iii) at least 40 marks

(iv) 50 to 70 marks

(v) at most 50 marks ?

Q.8 An organisation selected 2000 couples at random and surveyed them to determine a relationship between their income level and the number of childrens they have. The information gathered is list ed in the following table–

Monthly income (in Rs.)	Children per family			
	0	1	2	Above 2
Less than 8000	5	12	15	212
8000-12000	2	27	305	32
12000-15000	1	35	483	47
15000-20000	4	39	255	55
above-20,000	1	111	345	14

Now if a couple is chosen at random what is the probability that its :

(i) earning is less than Rs. 8000 and has more than 2 children.

(ii) earning is more than Rs. 15000 and has no children

(iii) has exactly 2 children

(iv) earning between Rs. 8000 to 20,000 and has exactly 1 child ?

Q.9 10 boxes of bulbs, each containing 25 bulbs, were checked for defective bulbs and following observation is made.

No. of defective bulbs	0	1	2	3
No. of boxes	4	2	3	1

Now a box is selected at random and checked for defective bulbs, find the probability that the box contains.

(i) two or more than two defective bulbs.

(ii) five defective bulbs.

(iii) less than or equal to 3 defective buls.

Q.10 A die is thrown 25 times and following observation is made –

Coming up No.	1	2	3	4	5	6
Frequency	7	5	4	2	3	4

For the above experiment define two events out of which one is sure event and other is impossible event.

Q.11 Here is an extract from a mortality table.

Age (in years)	60	61	62	63	64	65
Number of persons surving out of a sample of one million	16090	11490	8012	5448	3607	2320

(i) Based on this information, what is the probability of a person aged 60, of dying within a year ?

(ii) What is the probability that a person 'aged 61' will live for 4 years ?

ANSWER KEY

1. (i) gambling (ii) event (iii) 0, 1 (iv) 1 (v) 0.

2. (i) $\frac{17}{50}$ (ii) $\frac{31}{50}$

3. (i) $\frac{19}{60}$ (ii) $\frac{407}{750}$ (iii) $\frac{211}{1500}$, yes, sum = 1

4. (i) $\frac{3}{5}$ (ii) 0 (iii) $\frac{2}{5}$

5. (i) $\frac{9}{25}$ (ii) $\frac{19}{40}$ (iii) $\frac{177}{200}$

6. (i) $\frac{7}{100}$ (ii) $\frac{47}{100}$ (iii) $\frac{53}{100}$ (iv) $\frac{39}{100}$ (v) $\frac{33}{100}$

7. (i) $\frac{7}{90}$ (ii) $\frac{4}{45}$ (iii) $\frac{7}{10}$ (iv) $\frac{7}{18}$ (v) $\frac{47}{90}$

8. (i) $\frac{53}{500}$ (ii) $\frac{1}{400}$ (iii) $\frac{1403}{2000}$ (iv) $\frac{101}{2000}$

9. (i) $\frac{2}{5}$ (ii) 0 (iii) 1

10. Sure event : getting a number less than equal to 6. and Impossible event : getting a number more than 6.

11. (i) $\frac{460}{1609}$ (ii) $\frac{232}{1149}$

EXERCISE – II SCHOOL EXAM/BOARD

Q.1 Three coins are tossed simultaneously 100 times with the following frequencies of different outcomes :

Outcome :	No head	One head	Two heads	Three heads
Frequency :	14	38	36	12

If the three coins are simultaneously tossed again, comput the probability of -

(i) 2 heads coming up

(ii) 3 heads coming up

(iii) at least one head coming up

(iv) getting more heads than tails

(v) getting more tails than heads

Q.2 1500 families with 2 children were selected randomly and the followig data were recorded :

Number of girls in a family:	0	1	2
Number of families:	211	814	475

If a family is chosen at random, compute the probability that it has -

(i) No girl

(ii) 1 girl

(iii) 2 girls

(iv) at most one girl

(v) more girls than boys

Q.3 It is known that a box of 600 electric bulbs contains 12 defective bulbs. One bulb is taken out at random from this box. What is the probability that it is non-defective bulb ?

Q.4 A card is drawn from a pack of 52 cards. What is the probability of getting an ace ?

Q.5 When a card is drawn from a pack of 52 cards. Find the probability that it may be either a king or a queen.

Q.6 One card is drawn from a pack of 52 cards. Find the probability that the card drawn is red or king.

Q.7 In a cricket match, a batsman hits a boundary 6 times out of 30 balls he plays. Find the probability that on a ball played :

(i) he hits boundary

(ii) he does not hit a boundary

Q.8 The king, queen and jack of clubs are removed from a deck of 52 playing cards and then well shuffled. One card is selected from the remaining cards. Find the probability of getting

(i) a heart

(ii) a king

(iii) a club

(iv) the '10' of hearts

Q.9 If a coin is tossed two times, what is the probability of getting 'head' at least once ?

Q.10 A number is chosen at random among the first 100 natural numbers. Find the probability that the number chosen being a multiple of 5.

Q.11 From a set of 17 cards, numbered 1, 2, ..., 17, one is drawn. What is the probability that is number is multiple of 3 or 7 ?

Q.12 A company selected 2400 families at random and survey them to determine a relationship between income level and the number of vehicles in home. The informaton gathered is listed in the table below :

Monthly income : (in Rs)	Vehicles per family			
	0	1	2	Above 2
Less than 7000	10	180	25	0
7000-10000	0	270	27	2
10000-13000	1	609	29	1
13000-16000	2	409	29	25
16000 or more	1	580	82	88

If a family is chosen, find the probability that the family is :

(i) earning Rs 10000-13000 per month and owning exactly 2 vehicles.

(ii) earning Rs 16000 or more per month and owning exactly 1 vehicle.

(iii) earning less than Rs 7000 per month and does not own any vehicle.

(iv) earning Rs 13000-16000 per month and owning more than 2 vehicle.

(v) owning not more than 1 vehicle

(vi) owning at least one vehicle.

Q.13 There are 5 green, 6 black and 7 white balls in a bag. A ball it drawn at random from the bag. Find the probability that it may be -

(i) a white ball

(ii) either a green or a black ball

(iii) not a black ball

Q.14 A bag contains 4 red and 8 blue marbles. A marble is drawn at random. What is the probability of drawing
(i) a red marble ? (ii) a blue marble ?

Q.15 A bag contains 6 black, 7 red and 2 white balls. A ball is drawn from the bag at random. Find the probability that the ball drawn is -
(i) Red (ii) Black or white
(iii) Not black

Q.16 Two coins are tossed simultaneously. Find the probability of getting -
(i) two tails
(ii) at least one tail
(iii) no tail

Q.17 On tossing three coins simultaneously, find the probability of getting -
(i) 3 tails
(ii) 2 tails
(iii) No tail
(iv) 2 heads and 1 tail
(v) at least one head

Q.18 17 cards numbered 1, 2, 3, ..., 16, 17 are put in a box and mixed throughly. One person drawn a card from the box. Find the probability that the number on the card is-
(i) odd
(ii) a prime
(iii) divisible by 3
(iv) not divisible by 3 and 2 both

Q.19 Answer the following in one word, one sentence or as per the exact requirement:
(i) If.P (E) = 0·2. find P (not – E)
(ii) "Probability of an event can not be greater than 1"
Is the statement true or false?
(iii) "P (E) > P (not – E)"
Is the statement true or false?
(iv) What is the probability of a sure event?
(v) If a coin is.tossed 40 times and 19 times head comes and 21 times tail comes, write the probability of getting a head in a trial out of these 40 trials of the experiment.

Q.20 There are 50 students in a class and their results is as below:

Result (Pass/Fail)	Pass	Fail
No. of students	35	15

If a student chosen at random out of the class (i.e., without any bias), find the probability that the student is not failing (i.e., the student passed the examination).

Q.21 A coin is tossed 400 times and the data of outcomes is a below:

Outcome (H/T)	H	T
Frequency	280	120

Find (i) P (H), i.e., probability of getting head and (ii) P (T), i.e., probability of getting tail. (iii) the value of P (H) + P (T).

Q.22 A die having six faces is tossed 80 times and the data is as below:

Outcome	1	2	3	4	5	6
Frequency	10	20	10	28	8	4

Find (i) P (1) (ii) P (4) (iii) P (6) (iv) P (5).

Q.23 Three similar coins were tossed simultaneously for 100 times and the data recorded is as given below :

No. of heads	0	1	2	3	Total number of tosses
No. of tosses = frequency	22	30	28	20	100

(i) Find the probability of two heads and one tail in a toss.
(ii) Find the probability of three heads and no tail in a toss.
(iii) Find the probability of atleast one head in a toss.
(iv) Show that the sum of the probabilities of all the possible outcomes in a toss is equal to 1.
(v) Find the probability of getting 4 heads in a toss.
(vi) Find the probability of getting not more than 3 heads in a toss.
(vii) Find the probability of getting more than one head in a toss.
(viii) Find the probability of getting less than three heads in a toss.

Q.24 A die is thrown 200 times and the outcomes 1,2, 3, 4. 5, 6 have frequencies as below:

Outcome	1	2	3	4	5	6
Frequency	40	38	43	29	28	22

Find the probabilities of the following events in a toss (trial) :
(i) getting 6
(ii) getting 1
(iii) getting 3
(iv) getting an even number
(v) getting an odd number
(vi) getting a number more than 3
(vii) getting a number less than 3
(viii) getting a number less than 5
(ix) getting a number more than 6
(x) getting a number less than one.
(xi) getting a number more than 1 and less than 6.

Q.25 On one page of a telephone directory, there were 200 telephone numbers. The frequency distribution of their unit place digit (for example in the number 25828573, the unit place digit is 3) is given in table below :

Digit	0	1	2	3	4	5	6	7	8	9
Frequency	22	26	22	22	20	10	14	28	16	20

Without looking at the page, the pencil is placed on one of these numbers, i.e., the number is chosen at random. What is the probability that the digit in its unit place is (i) 6 (ii) less than 3 (iii) more than 7.

Q.26 A tyre manufacturing company kept a record of the distance covered before a tyre needed to be replaced. The table show the result of 1000 cases :

Distance (in km)	Less than 4000	4000 to 9000	9000 to 14000	More than 14000
Frequency	20	210	325	445

If you buy a tyre of this company what is the probability that:
(i) it will need to be replaced before it has covered 4000 km ?
(ii) it will last more than 9000 km ?
(iii) it will need to be replaced after it has covered somewhere between 4000 km and 14000 km ?

Q.27 Twenty bags of sugar, each marked 10 kg, actually give the following data:

Weight of a bag (in kg)	9.5-9.8	9.8-9.9	9.9-10.0	10.0-10.1
No. of bags	1	2	5	12

The lower limits of the classes are inclusive and the upper limits are exclusive.
What is the probability that the bag selected at random (without any reference) weighs 10 kg or more?

Q.28 The record of a weather station shows that out of the past 250 consecutive days, its weather forecasts were correct 175 times.
(i) What is the probability that on a given day it was correct?
(ii) What is the probability that it was not correct on a given day.

Q.29 A survey was conducted by car manufacturing company in a metropolitan city on 1000 persons having monthly income from Rs. 30,001 to Rs. 50,000. Thc data about the number of persons in various categories is as under:

Monthly income (in rupees)	Number of Cars		
	1	2	More than 2
30,001-40,000	400	50	25
40,001-50,000	100	300	125

Find the probability that a person selected at random
(i) in the income slab 40,001-50,000 have more than 2 cars.
(ii) in the income slab 30,001 to 50,000 have two cars.

ANSWER KEY

1. (i) 0.36 (ii) 0.12 (iii) 0.86 (iv) 0.48 (v) 0.52
2. (i) 0.1406 (ii) 0.5426 (iii) 0.3166 (iv) 0.6833 (v) 0.3166
3. $\frac{49}{50}$ **4.** $\frac{1}{13}$ **5.** $\frac{2}{13}$
6. $\frac{7}{13}$ **7.** (i) 0.2 (ii) 0.8
8. (i) $\frac{13}{49}$ (ii) $\frac{3}{49}$ (iii) $\frac{10}{49}$ (iv) $\frac{1}{49}$
9. $\frac{3}{4}$ **10.** $\frac{1}{5}$ **11.** $\frac{7}{17}$
12. (i) $\frac{29}{2400}$ (ii) $\frac{29}{120}$ (iii) $\frac{1}{240}$ (iv) $\frac{1}{96}$ (v) $\frac{1031}{1200}$ (vi) $\frac{589}{600}$
13. (i) $\frac{7}{18}$ (ii) $\frac{11}{18}$ (iii) $\frac{2}{3}$
14. (i) $\frac{1}{3}$ (ii) $\frac{2}{3}$ **15.** (i) $\frac{7}{15}$ (ii) $\frac{8}{15}$ (iii) $\frac{3}{5}$
16. (i) $\frac{1}{4}$ (ii) $\frac{3}{4}$ (iii) $\frac{1}{4}$
17. (i) $\frac{1}{8}$ (ii) $\frac{3}{8}$ (iii) $\frac{1}{8}$ (iv) $\frac{3}{8}$ (v) $\frac{7}{8}$
18. (i) $\frac{9}{17}$ (ii) $\frac{7}{17}$ (iii) $\frac{5}{17}$ (iv) $\frac{15}{17}$
19. (i) 0·8 (ii) True (iii) False (iv) 1 (v) 19/40
20. 0·7 **21.** (i) 0·7 (i) 0·3 (iii) 1
22. (i) 0.125 (ii) 0·35 (iii) 0·05 (iv) 0·1
23. (i) 0·28 (ii) 0·20 (iii) 0·78 (v) 0 (vi) 1 (vii) 0.48 (viii) 0·80
24. (i) 0·11 (ii) 0·20 (iii) 0·215 (iv) 0.445 (v) 0.555 (vi) 0.395 (vii) 0.39 (viii) 0.75 (ix) 0 (x) 0 (xi) 0.69
25. (i) 0·07 (ii) 0·35 (iii) 0·18
26. (i) 0.02 (ii) 0.77 (iii) 0.535
27. 0.6 **28.** (i) 0.7 (ii) 0.3
29. (i) 0.125 (ii) 0.35

EXERCISE – III MULTIPLE CHOICE QUESTIONS

Q.1 Two coins are tossed 200 times and we get
Two heads : 60 times
One heads : 72 times
No heads : 68 times
Then the probability of getting two tails is ;

(A) $\frac{600}{200}$ (B) $\frac{72}{200}$

(C) $\frac{68}{200}$ (D) none of these

Q.2 A bag contains 5 black, 8 red and 7 white balls. A ball is drawn from bag at random. Then the probability of getting neither black nor white ball is

(A) $\frac{1}{4}$ (B) $\frac{2}{5}$

(C) $\frac{7}{20}$ (D) none of these

Q.3 The probability of sun rising from east is :

(A) 1 (B) $\frac{1}{2}$

(C) $\frac{1}{4}$ (D) $\frac{1}{8}$

Q.4 The probability of getting a number less than 5 in a single throw of a die is :

(A) $\frac{1}{5}$ (B) $\frac{1}{3}$

(C) $\frac{2}{3}$ (D) $\frac{5}{6}$

Q.5 All face cards (kings, queens and jacks) are removed from a deck of 52 playing cards and then well shuffled. One card is selected from the remaining cards. The probability of this card to be a diamond is

(A) $\frac{13}{40}$ (B) $\frac{9}{40}$

(C) $\frac{1}{4}$ (D) none of these

Q.6 The percentage of marks obtained by a student in the monthly units tests are given below :

Unit Test	I	II	III	IV	V
Percentage of marks obtained	69	71	73	68	74

Based on this data, the probability that a student selected at random gets more than 70% marks in the next units test is :

(A) $\frac{3}{5}$ (B) $\frac{148}{355}$

(C) $\frac{1}{2}$ (D) none of these

Q.7 Following cannot be the probability of an event

(A) $\frac{11}{13}$ (B) $\frac{13}{11}$

(C) $\frac{5}{7}$ (D) none of these

Q.8 The probability of getting 'Monday' as the first day of a randomly selected years, is :

(A) $\frac{1}{7}$ (B) $\frac{1}{30}$

(C) $\frac{1}{31}$ (D) $\frac{1}{365}$

Q.9 The approximate distances from resident to school of 70 students, choosen from a school are as follows :

Approximate distance from home	Less than 5	5 but less than 7	more than 7
Number of students	35	25	10

Then the probability that a student lives within 5 km from the school is :

(A) $\frac{1}{2}$ (B) $\frac{5}{14}$

(C) $\frac{1}{7}$ (D) none of these

Q.10 The probability of getting 6 on a die is :

(A) $\frac{1}{2}$ (B) $\frac{1}{3}$

(C) $\frac{1}{4}$ (D) $\frac{1}{6}$

Q.11 In a sample study of 642 people, it was found that 514 people have a high school certificate. If a person is selected at random, the probability that the person has a high school certificate is:

(A) 0.5 (B) 0.6

(C) 0.7 (D) 0.8

Q.12 In a survey of 364 children aged 19 – 36 months, it was found that 91 liked to eat potato chips. If a child is seleted at random, the probability that he she does not like to eat potato chips is :

(A) 0.25 (B) 0.50

(C) 0.75 (D) 0.80

Q.13 A coin is tossed 100 times with following outcomes head 43 times and tail 57 times. In a single throw of a coin, what is the probability of getting a head ?

(A) $\frac{43}{57}$ (B) $\frac{57}{43}$

(C) $\frac{43}{100}$ (D) $\frac{7}{50}$

Q.14 A coin is tossed 200 times with following outcomes head 112 times and tail 88 times. In a single throw of a coin what is the probability of getting a tail ?

(A) $\frac{11}{25}$ (B) $\frac{14}{25}$

(C) $\frac{11}{14}$ (D) $\frac{14}{11}$

Q.15 A survey of 200 person of a locality shows that liking and disliking of tea.

No. of persons who like tea	148
No. of persons who dislike tea	52

Out of these persons one was chosen at random. What is the probability that the chosen person likes tea ?

(A) $\frac{13}{37}$ (B) $\frac{37}{13}$

(C) $\frac{13}{50}$ (D) $\frac{37}{50}$

Q.16 In a locality, 1000 families were chosen at random and the following data was collected :

Number of children in each family	0	1	2	3	4 or more
Number of families	6	184	672	127	11

Out of these families , a family was chosen at random, what is the probability that the chosen family has 2 chilidren ?

(A) $\frac{1}{336}$ (B) $\frac{84}{125}$

(C) $\frac{41}{125}$ (D) $\frac{164}{375}$

Q.17 The table given below shows the month of birth of 36 students of a class :

Month of birth	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
No. of students	4	3	5	0	1	6	1	3	4	3	4	2

A student is chosen at random from the class. What is the probability that the chosen student was born in October ?

(A) $\frac{1}{3}$ (B) $\frac{2}{3}$

(C) $\frac{1}{4}$ (D) $\frac{1}{12}$

Q.18 In 50 tosses of a coin, tail appears 32 times. If a coin is tossed at random, what is the probability of getting a head ?

(A) $\frac{1}{32}$ (B) $\frac{1}{18}$

(C) $\frac{16}{25}$ (D) $\frac{9}{25}$

Q.19 In a cricket match, a batsman hits a boundary 6 times out of 30 balls he plays. What is the probability that in a given throw, the ball does not hit the boundary ?

(A) $\frac{1}{4}$ (B) $\frac{1}{5}$

(C) $\frac{4}{5}$ (D) $\frac{3}{4}$

Q.20 A die is thrown 40 times and each time the number on the uppermost face is noted. It was recorded as under.

Outcome	1	2	3	4	5	6
Number of times	5	6	8	10	7	6

A die is thrown at random. What is the probability of getting a 5 ?

(A) $\frac{5}{7}$ (B) $\frac{7}{5}$

(C) $\frac{1}{8}$ (D) $\frac{7}{40}$

Q.21 In 50 throws of a die, the outcomes were noted as under :

Outcome	1	2	3	4	5	6
Number of times	8	9	6	7	12	8

A die is thrown at random. What is the probability of getting an even number ?

(A) $\frac{12}{25}$ (B) $\frac{3}{50}$

(C) $\frac{1}{8}$ (D) $\frac{1}{2}$

Q.22 In 65 throws of a die, the outcomes were noted as under :

Outcome	1	2	3	4	5	6
Number of times	8	10	12	16	9	10

A die is thrown at random. What is the probability of getting a prime number ?

(A) $\frac{3}{35}$ (B) $\frac{3}{5}$

(C) $\frac{31}{65}$ (D) $\frac{36}{65}$

Q.23 On one page of directory, there are 160 telephone numbers. The frequency distribution of the unit digit is given as under :

Unit place digit	0	1	2	3	4	5	6	7	8	9
Frequency	19	16	18	21	14	11	15	16	13	17

From this page, one of the numbers is chosen at random. What is the probability that the unit place digit in the chosen number is 6 ?

(A) $\frac{2}{5}$ (B) $\frac{3}{32}$

(C) $\frac{3}{80}$ (D) $\frac{29}{32}$

Q.24 Two coins are tossed 1000 times and the outcomes are recorded as under :

Number of heads	2	1	0
Frequency	266	540	194

A coin is thrown at random. What is the probability of getting at most one head ?

(A) $\frac{403}{500}$ (B) $\frac{27}{50}$

(C) $\frac{367}{500}$ (D) $\frac{97}{500}$

Q.25 80 bulbs are selected at random from a lot and their lifetime is recorded in the form of a frequency table given below :

Lifetime (in hours)	300	500	700	900	1100
Frequency	10	15	23	25	7

A bulb is chosen at random from the lot. What is the probability that the bulb chosen has lifetime less than 900 hours ?

(A) $\frac{73}{80}$ (B) $\frac{3}{5}$

(C) $\frac{5}{16}$ (D) $\frac{23}{80}$

Q.26 In a medical examination of 40 students of a class, the following blood groups are recorded:

Blood group	A	B	AB	O
No. of students	11	15	9	5

From this class, a student is chosen at random. What is the probability that the chosen student has blood group B ?

(A) $\frac{3}{8}$ (B) $\frac{5}{8}$

(C) $\frac{3}{5}$ (D) $\frac{8}{3}$

Q.27 In a group of 60 person, 35 like coffee. Out of this group, if one person is chosen at random, what is the probability that he or she does not like coffee

(A) $\frac{7}{12}$ (B) $\frac{5}{12}$

(C) $\frac{5}{7}$ (D) $\frac{3}{12}$

Q.28 A die is thrown 50 times and the outcomes are recorded as under :

Outcome	1	2	3	4	5	6
No. of times	11	9	8	5	7	10

If a die thrown at random, what is the probability of getting 8 ?

(A) $\frac{1}{5}$ (B) $\frac{3}{50}$

(C) $\frac{1}{3}$ (D) 0

Q.29 It is given that the probability of winning a game is 0.7. What is the probability of losing the game ?

(A) 0.8 (B) 0.3

(C) 0.7 (D) 0.07

Q.30 A coin is tossed 60 times and the tail appears 35 times. What is the probability of getting a head ?

(A) $\frac{7}{12}$ (B) $\frac{12}{7}$

(C) $\frac{5}{12}$ (D) $\frac{1}{25}$

Q.31 In a throw of a coin, the probability of getting a head is :

(A) $\frac{1}{2}$ (B) $\frac{1}{4}$

(C) 1 (D) None of these

Q.32 In a throw of a die, the probability of getting a prime number is –

(A) $\frac{1}{3}$ (B) $\frac{1}{2}$

(C) $\frac{2}{3}$ (D) $\frac{3}{4}$

Q.33 In a simultaneous throw of two coins, the probability of getting at least one head is –

(A) $\frac{1}{2}$ (B) $\frac{2}{3}$

(C) $\frac{3}{4}$ (D) $\frac{1}{3}$

Q.34 Three unbiased coins are tossed, What is the probability of getting exactly two heads?

(A) $\frac{1}{3}$ (B) $\frac{3}{4}$

(C) $\frac{2}{3}$ (D) $\frac{3}{8}$

Q.35 Three unbiased coins are tossed, What is the probability of getting at most 2 heads?

(A) $\frac{1}{4}$ (B) $\frac{3}{8}$

(C) $\frac{7}{8}$ (D) $\frac{1}{2}$

Q.36 What is the probability that a number selected from the numbers 1, 2, 3, 4, 5,... 16 is a prime number, is ?

(A) $\frac{1}{16}$ (B) $\frac{5}{8}$

(C) $\frac{3}{8}$ (D) $\frac{7}{16}$

Q.37 Tickets numbered 1 to 20 are mixed up and then a ticket is drawn at random. What is the probability that the ticket drawn bears a number which is a multiple of 3 ?

(A) $\frac{3}{20}$ (B) $\frac{3}{10}$

(C) $\frac{2}{5}$ (D) $\frac{1}{2}$

Q.38 One card is drawn at random from a pack of 52 cards. What is the probability that the card drawn is a face card ?

(A) $\frac{3}{13}$ (B) $\frac{1}{4}$

(C) $\frac{9}{52}$ (D) $\frac{1}{13}$

Q.39 One card is drawn of random from a pack of 52 cards. What is the probability that the card drawn is a king ?

(A) $\frac{1}{13}$ (B) $\frac{1}{52}$

(C) $\frac{3}{13}$ (D) $\frac{1}{4}$

Q.40 One card is drawn at random from a pack of 52 cards. What is the probability that the card drawn is either a red card or a king ?

(A) $\frac{6}{13}$ (B) $\frac{1}{2}$

(C) $\frac{7}{13}$ (D) $\frac{27}{52}$

Q.41 What is the probability that an ordinary year has 53 Sunday ?

(A) $\frac{53}{365}$ (B) $\frac{1}{7}$

(C) $\frac{2}{7}$ (D) $\frac{48}{53}$

Q.42 In a simultaneous throw of two dice, what is the probability of getting a total of 7 ?

(A) $\frac{1}{6}$ (B) $\frac{7}{12}$

(C) $\frac{7}{36}$ (D) $\frac{1}{4}$

Q.43 In a simultaneous throw of two dice, what is the probability of getting a doublet ?

(A) $\frac{1}{6}$ (B) $\frac{1}{4}$

(C) $\frac{3}{4}$ (D) $\frac{2}{3}$

Q.44 In a simultaneous throw of two dice, what is the probability of getting a total of 10 or 11 ?

(A) $\frac{7}{12}$ (B) $\frac{5}{36}$

(C) $\frac{1}{6}$ (D) $\frac{1}{4}$

Q.45 Tickets numbered from 1 to 20 are mixed up and a ticket is drawn at random. What is the probability that the ticket drawn has a number which is a multiple of 3 or 7

(A) $\frac{1}{15}$ (B) $\frac{1}{2}$

(C) $\frac{2}{5}$ (D) $\frac{7}{20}$

Q.46 A bag contains 6 black balls and 8 white balls. One ball is drawn at random. What is the probability that the ball drawn is white?

(A) $\frac{4}{7}$ (B) $\frac{3}{4}$

(C) $\frac{4}{3}$ (D) $\frac{1}{8}$

Q.47 What is the probability of getting a king or a queen in a single drawn from a pack of 52 cards?

(A) $\frac{1}{26}$ (B) $\frac{1}{13}$

(C) $\frac{2}{13}$ (D) None of these

Q.48 In a lottery there are 10 prizes and 25 blanks. What is the probability of getting prize ?

(A) $\frac{1}{10}$ (B) $\frac{2}{5}$

(C) $\frac{2}{7}$ (D) $\frac{5}{7}$

Q.49 Arun contains 9 red, 7 white and 4 black balls. A ball is drawn at random. What is the probability that the ball drawn is not red ?

(A) $\frac{1}{11}$ (B) $\frac{9}{11}$

(C) $\frac{2}{11}$ (D) $\frac{11}{20}$

Q.50 A card is drawn from a pack of 52 cards. A card is drawn at random. What is the probability that it is neither a heart nor a king ?

(A) $\frac{4}{13}$ (B) $\frac{9}{13}$

(C) $\frac{2}{13}$ (D) $\frac{5}{13}$

Q.51 In a single throw of two dice what is the probability of not getting same number of both the dice ?

(A) $\frac{1}{6}$ (B) $\frac{2}{3}$

(C) $\frac{5}{6}$ (D) $\frac{1}{3}$

Q.52 A card is drawn at random from a pack of 52 cards. What is the probability that the card drawn is a spade or a king ?

(A) $\frac{4}{13}$ (B) $\frac{3}{13}$

(C) $\frac{2}{13}$ (D) $\frac{1}{13}$

ANSWER KEY

1.	C	**2.**	B	**3.**	A	**4.**	C
5.	C	**6.**	A	**7.**	B	**8.**	A
9.	A	**10.**	D	**11.**	D	**12.**	C
13.	C	**14.**	A	**15.**	D	**16.**	B
17.	D	**18.**	D	**19.**	C	**20.**	D
21.	A	**22.**	C	**23.**	B	**24.**	C
25.	B	**26.**	A	**27.**	B	**28.**	D
29.	B	**30.**	C	**31.**	A	**32.**	B
33.	C	**34.**	D	**35.**	C	**36.**	C
37.	B	**38.**	A	**39.**	A	**40.**	C
41.	B	**42.**	A	**43.**	A	**44.**	B
45.	C	**46.**	A	**47.**	C	**48.**	C
49.	D	**50.**	B	**51.**	C	**52.**	A

EXERCISE – IV OLYMPIAD QUESTIONS

OBJECTIVE TYPE QUESTIONS

CHOOSE THE CORRECT ONE :-

1. If A be the event such that P(A) = $\frac{2}{5}$, then P(not A) is equal to

(A) $\frac{3}{5}$ (B) $\frac{4}{5}$ (C) $\frac{1}{5}$ (D) None of these

An unbiased die is thrown (Q. NO.2 to 6)

2. The probability of getting a prime number is

(A) $\frac{1}{6}$ (B) $\frac{1}{3}$ (C) $\frac{1}{2}$ (D) $\frac{2}{3}$

3. The probability of getting a multiple of 3 is

(A) $\frac{1}{6}$ (B) $\frac{1}{3}$ (C) $\frac{3}{6}$ (D) $\frac{4}{6}$

4. The probability of getting a number greater than 1 is

(A) $\frac{1}{6}$ (B) $\frac{2}{6}$ (C) $\frac{4}{6}$ (D) $\frac{5}{6}$

5. The probability of getting a number between 1 and 6 is

(A) $\frac{1}{6}$ (B) $\frac{2}{6}$ (C) $\frac{3}{4}$ (D) $\frac{2}{3}$

6. The probability of getting an odd number is

(A) $\frac{1}{6}$ (B) $\frac{2}{6}$ (C) $\frac{4}{6}$ (D) None of these

Two unbiased coins are tossed simultaneously (Q. No. 7 to 10)

7. The probability of getting one head is

(A) $\frac{1}{2}$ (B) $\frac{3}{4}$ (C) $\frac{1}{4}$ (D) None of these

8. The probability of getting two heads

(A) $\frac{1}{2}$ (B) $\frac{1}{4}$ (C) $\frac{3}{4}$ (D) None of these

9. The probability of getting no head is

(A) $\frac{1}{4}$ (B) $\frac{3}{4}$ (C) $\frac{1}{2}$ (D) None of these

10. The probability of getting at least one head is

(A) $\frac{1}{2}$ (B) $\frac{1}{4}$ (C) $\frac{3}{4}$ (D) None of these

One card is drawn from a pack of 52 cards (Q. No. 11 to 14)

11. The probability of getting a jack card is

(A) $\frac{1}{13}$ (B) $\frac{2}{13}$ (C) $\frac{3}{13}$ (D) $\frac{4}{13}$

12. The probability of getting a face card is

(A) $\frac{1}{13}$ (B) $\frac{2}{13}$ (C) $\frac{3}{13}$ (D) $\frac{4}{13}$

13. The probability of getting a '10' of black suit is

(A) $\frac{1}{26}$ (B) $\frac{1}{13}$ (C) $\frac{3}{26}$ (D) None of these

14. The probability of getting a red and a king card is

(A) $\frac{5}{26}$ (B) $\frac{1}{13}$ (C) $\frac{7}{26}$ (D) None of these

15. A bag contains 4 red balls and 3 green balls. A ball is drawn at random. The probability of drawing a green ball is

(A) $\frac{1}{7}$ (B) $\frac{2}{7}$ (C) $\frac{3}{7}$ (D) $\frac{4}{7}$

16. P(E) + P($\bar{E}$) is equal to

(A) 0 (B) $\frac{1}{2}$ (C) 1 (D) None of these

Which one of the following cannot be the probability of an event (Q. No. 17 to 18)

17. (A) $\frac{1}{3}$ (B) $\frac{11}{36}$ (C) $\frac{-2}{3}$ (D) 1

18. (A) $\frac{2}{7}$ (B) 0 (C) $\frac{13}{29}$ (D) $\frac{5}{2}$

Choose the correct alternative for each of the following (Q. No. 19 to 22)

19. Probability of an impossible event is equal to

(A) 1 (B) 0 (C) $\frac{1}{2}$ (D) None of these

20. If $P(E_1) = \frac{1}{6}$, $P(E_2) = \frac{1}{3}$, $P(E_3) = \frac{1}{6}$, where E_1, E_2, E_3 and E_4 are elementary events of a random experiment, then $P(E_4)$ is equal to

(A) $\frac{1}{2}$ (B) $\frac{2}{3}$ (C) $\frac{1}{3}$ (D) None of these

21. Cards each marked with one of the numbers 4, 5, 6,...., 20 are placed in a box and mixed thoroughly. One card is drawn at random from the box. Then, the probability of getting an even prime number is

(A) 0 (B) 1 (C) $\frac{1}{2}$ (D) None of these

22. A bag contains 5 red and 4 black balls. A ball is drawn at random from the bag. Then, the probability of getting a black ball is

(A) $\frac{4}{5}$ (B) $\frac{4}{9}$ (C) $\frac{1}{5}$ (D) $\frac{1}{4}$

PROBABILITY — ANSWER KEY — EXERCISE # 4

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	A	C	B	D	D	D	A	B	A	C	A	C	A	D	C
Que.	16	17	18	19	20	21	22								
Ans.	C	C	D	B	C	A	B								